THE AMERICAN GAS LIGHT JOURNAL

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BRIEFLY TOLD.

THE OUTING TRIP OF THE AMERICAN GAS LIGHT ASSOCIATION.—As has been heretofore noted in the JOURNAL the last day of the 30th convention of the American Gas Light Association was devoted to an inspection of the various gas and electric plants in and about New York city, which inspection was made possible through the courtesy of the Consolidated Gas Company, whose Managers had, in connection with the local committee of arrangements, prepared a most pleasant way of making the inspection tour. The following brief notes respecting the journey were prepared by one who took active part in it: "About 10 A.M. of the morning of the 17th a goodly number of the members, despite the forbidding aspect of the weather conditions, for the clouds were lowering and out of the northeast a mean wind was blowing (and many ladies were amongst the prospective voyagers), assembled at the magnificent new station of the New York Edison Company, on the East River, on the block bounded by 38th and 39th streets. This was the initiatory point of the inspection tour. The Company had very thoughtfully provided illustrated booklets, giving very complete accounts of the plant and its workings. Guides were also in attendance to pilot the visitors around the massive machinery and to prevent them from getting too intimate with the 6,600 volts that seemed to be everywhere. The engines are of the 3-cylinder, compound vertical type, built by the Westinghouse Company, and are rated at 5,500-horse power, but are actually good for 8,000-horse power. The engines are direct-connected to 3-phase General Electric Company generators. Envious eyes were cast on this modern method of electric generation by some of the visitors who in years gone by were forced to annex some struggling electric company, with its antiquated machinery, to keep it from going to the wall, and incidentally to regulate competition. The double-deck boiler house, with its fifty-six 650-horse power boilers, coal storage and automatic stoking machinery, proved a great attraction. The steamer "Nantasket" lay alongside the Edison Company's wharf, and soon some 250 gas men were on board—notwithstanding the lowering skies about two score ladies ventured the dangers of the deep, and by their presence added greatly to the social side of the voyage. The first stop was made at the Ravenswood works of the New Amsterdam Gas Company, which plant is on the east bank of the East River, at a point close to Long Island City. When the additions to the plant now underway are completed it will be the largest water gas plant in the world, with a daily output capacity of something close to 25,000,000 cubic feet. Chief Engineer Alten S. Miller and Superintendent W. Cullen Morris escorted the party through the works. The plant is thoroughly and fully equipped, and has many labor-saving and automatic devices not ordinarily seen in these parts. Interesting objects were the cast iron condensers, permitting the use of salt water; also, the new coal conveyor, which, it was whispered, will unload and store coal for 1½ cents per ton. The new 5,000,000-foot holder now in course of construction naturally came in for a fair share of attention. In due time the whistle summoned all back to the boat, and later on an attempt was made to land at the wharf of the Metropolitan Street Railway Company's new power house, on the west bank of the East River, about the foot of 94th street, but the tide was so strong and swirling that the landing could not be made in safety. The next number on the programme was the inspection and testing of a most inviting luncheon provided by our hosts. While the men who had the gentler ones under their direct care were attending to this, those who were so disposed took a "run up" to the Manhattan station, East, of the Consolidated Company, to witness the operation of the steam driven drawing and charging machines—this station is one of the coal gas plants of the Company. A sail up the Hudson, to General Grant's tomb and back again to 59th street, concluded the outing. Considerable regret was expressed that the trip did not include a visit to the works of the Central Union Gas Company, of New York city, which is so ably directed by Mr. W. R. Beal, whose excellent leading of the last convention of the Association as President thereof will long be pleasantly remembered. Captain White deserves great credit and thanks for his successful efforts as master of ceremonies, and the same should go with reference to "Ed. Witherby," who did all in his power to keep the members from catching cold.—G."

ANNUAL MEETING OF THE MANAGERS OF THE MCMILLIN COMPANIES.—As a prelude to the last New York convention of the American Gas Light Association the Managers of the various companies in the McMillin syndicate held a general meeting in this city, on the 13th and

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14th insts. The sessions were brought off in the handsome "Military Room" of the Engineers' Club, 374 Fifth avenue. The proceedings, which were of an unusually interesting character—more's the pity, we are only permitted to give the briefest sort of a resume of them—were directed from the Chair by Mr. E. G. Cowdery, of Milwaukee, Wis. Those present included Col H. B. Wilson and Messrs. W. F. Douthirt and Henry L. Doherty, of New York; Mr. F. B. Wheeler, of Binghamton, N. Y.; Messrs. Wales and Hallen, of Grand Rapids, Mich.; Mr. Paul Doty, of Detroit, Mich.; Messrs. Eaton and Wolfe, of Jackson, Mich.; Messrs. W. B. Tuttle and Jeliffe, of Long Branch, N. J., Messrs. E. G. Cowdery, S. J. Glass, R. B. Brown and E Haase, of Milwaukee, Wis.; Mr. A. P. Lathrop, of St. Paul, Minn.; Mr. E. E. Eysenbach, of Columbus, O.; Messrs. K. M. Mitchell and F. Labrunerie, of St. Joseph, Mo.; Mr. I. Butterworth, of Denver, Col.; Mr. M. E. Malone, of Madison, Wis.; Mr. E. W. Bell, of St. Louis, Mo.; Mr. Huston, of San Antonio, Tex.; Mr. Van Ness, of Lincoln, Neb. The first set subject for discussion was as to how often and when the meetings should be called in the future. It was decided that the best results would be obtained by having one meeting of the officers from the various gas departments, and one meeting of the officers from the several electrical departments each year. It was also considered advisable to abandon the present method of having the meetings just prior to that of any of the gas light associations, since it was not convenient for a number of the companies to prepare the information to be used in the sessions at the time of either of the American or the Western Gas Light Association meetings, and the places designated were not always convenient to some of those who regularly take part in the convention of the McMillin Managers. Eventually the time appointed for the meeting of the representatives of the gas department was early in March, that of the electrical department to be held some time in February of each year. Hereafter the place of meeting is to be determined by the officers of the McMillin Association. The choice was most convenient for a majority of the companies, and does not interfere with the set meetings of the larger Associations. For the sake of uniform comparison between plants, it was arranged to end the fiscal periods of the various companies at the end of the calendar year. The next subject for discussion was as to the various types of benches in use, and a paper was presented describing the three-quarter depth Weber benches installed at Long Branch, N. J. The Chair was instructed to appoint a committee on specifications for coal gas benches, with instructions for operation. The disposal of coke was next taken up, and descriptions of the methods of burning it at Madison, Wis., with small grates and natural draft, and at Denver, Col., with underfeed stoker, were given. A discussion on "Gas Rates," of considerable length, in which Mr. Doherty took an active part, followed. A committee was appointed to draw resolutions of regret over the untimely death of Mr. E. H. Jenkins, of San Antonio, Tex. The remainder of the day was passed in the discussion of tables of figures on various subjects. The meeting adjourned to accept an invitation to a farewell dinner at the Lotos Club, given by Mr. W. F. Douthirt, who has recently severed his connection with the McMillin interests, and has entered the home offices of the United Gas Improvement Company, Philadelphia, Pa. The proceedings of the morning of the second day were opened by a brisk discussion on the subject of the extension of gas mains into new territory. Comparisons were made between the various companies as to the length of main run for each consumer, and the methods of estimating the advisability of extensions in various districts. The tables showing the analysis of pay rolls with the various companies were next presented and discussed. The subject of industrial fuel gas was also taken up, and reports made on it were handed in by the various companies. Tables were presented enumerating the various uses to which gas was put in each town, and the extent of sale for each purpose. The advisability of installing small experimental coal gas plants in large works was next discussed, and a report from Denver on this subject was read. The report demonstrated that a very considerable saving was possible by the information acquired in this manner in regard to the nature of the various grades of coal. Attention was next called to the scurfing of retorts, and reports were made on the various methods used. An investigating committee was appointed to carry on this investigation. Some new features in the manufacture of water gas were presented by Mr. Paul Doty. A discussion of various data in regard to the promotion of new business, and other subjects as well occupied the remainder of the day. The meeting was a very successful one.

The officers elected to serve for the next year were:

President.—Mr. Paul Doty, Detroit, Mich.
Vice-President.—Mr. Irvin Butterworth, Denver, Col.
Secretary.—Mr. F. B. Wheeler, Binghamton, N. Y.

Address of the President (Mr. William R. Beal, New York City), of the American Gas Light Association, on the Occasion of Its 30th Annual Meeting, New York City, October 15th to 17th.

In welcoming you to New York I congratulate you on your good fortune in meeting in a city so full of interest to men of every calling, and especially to men in our profession, affording as it does such complete opportunity to examine into every feature of our business, which, in its varied operations, is by its very nature confined to a given and restricted locality. In the great city of the Western Hemisphere the product of its marvellous skill in engineering and mechanics, and of its progressive enterprise and business methods, you will if so minded have ample opportunity to secure valuable information, theoretical and practical, as to buildings, machinery and apparatus, as well as of business methods which have stood the test of intelligent experience.

You will also be guests in a city in which the problems of competition and combination, of municipal privileges and interference, and of taxation for franchises for city and State purposes are as numerous as perplexing, and as indefinite as they may be found in any other city of the world.

The American Association has held seven of its conventions in this city since its organization in 1873. When we met here in 1899 the companies then supplying gas were carrying on a fierce competition. The nominal charge per 1,000 was 50 cents and 65 cents, but the rate in competing districts was such as could be readily made by keen traders.

This is the first time that we have found our business managed without the embarrassments, the friction and wastefulness of competition.

The first gas company to do business in New York was organized in 1823. Since that date 25 companies have built plants and carried on business in the territory now known as Greater New York.

It may be fairly assumed that the business is now in such an assured position that it can claim and will secure such judicial consideration and wise management that it will permanently meet all the needs of our growing metropolis, and be satisfactory alike to owners and citizens.

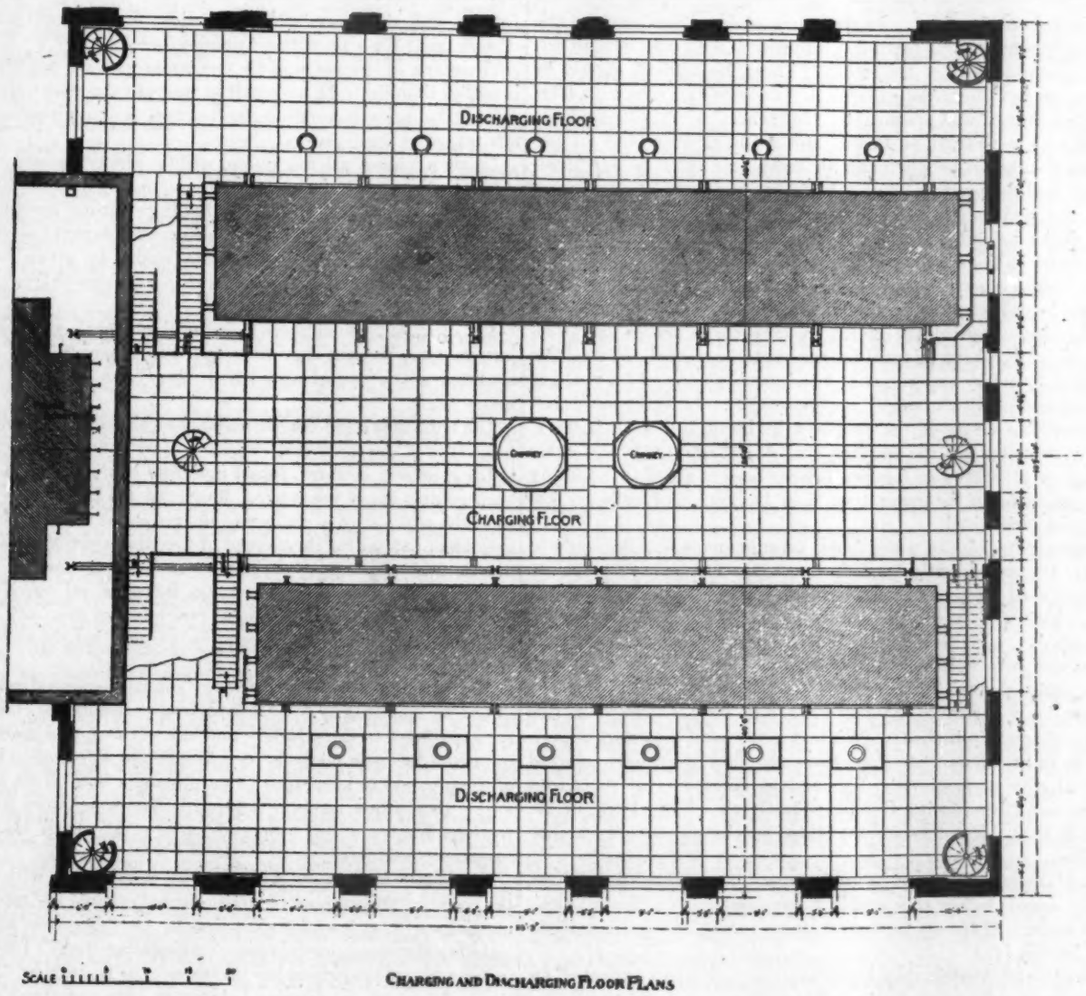
The erection of hastily designed plants, the usual result of competition, has operated somewhat to prevent the erection of such a complete and comprehensive plant as the great and constant growth of the metropolis would warrant. The Consolidated Gas Company has, however, with great wisdom, secured a large and admirably located site, and this is being prepared for the erection of buildings and apparatus now being designed by its able engineers, for the major part of the supply of the great city. When the Association holds its next convention here, its members will be able to visit and examine one of the largest plants in the world, which, in the arrangement and character of its buildings, and in the efficiency of its machinery and apparatus, will be as complete as the state of the art and the use of resources can make it.

As a part of our proceedings there will be read to you invitations to visit the various gas and electric light stations in the city. This will give you an opportunity to see the most recently built, improved and up-to-date station devoted entirely to the manufacture of water gas, and having a daily capacity of 25,000,000 cubic feet. At this station, which has the greatest capacity of any of its kind in the world, may be found in use the best methods, appliances and machinery adapted to the business to-day. It was here that the first 5,000,000-foot gasholder in the United States was erected, and it is to-day the only holder in this country that rises above the guiding columns when filled.

At another station there is in process of erection two stacks of inclined retorts, this being the third practical adoption of inclines, and the largest installation in this country up-to-date. One stack is being put up by Messrs. Bartlett, Hayward & Co., agents of manufacturers of firebrick material at Stettin, Germany. The retorts are 18 feet long and 25 inches wide, tapering to 23 inches at the upper end and 15½ inches high inside. The other stack is being put up with all American material by the Laclede Firebrick Manufacturing Company, of St. Louis. The retorts will be 20 feet long, 26 inches wide, tapering to 25 inches at the upper end, and 18 inches high. These retorts are larger than any that have ever been used in settings of inclines, and practice with them is looked forward to with great interest.

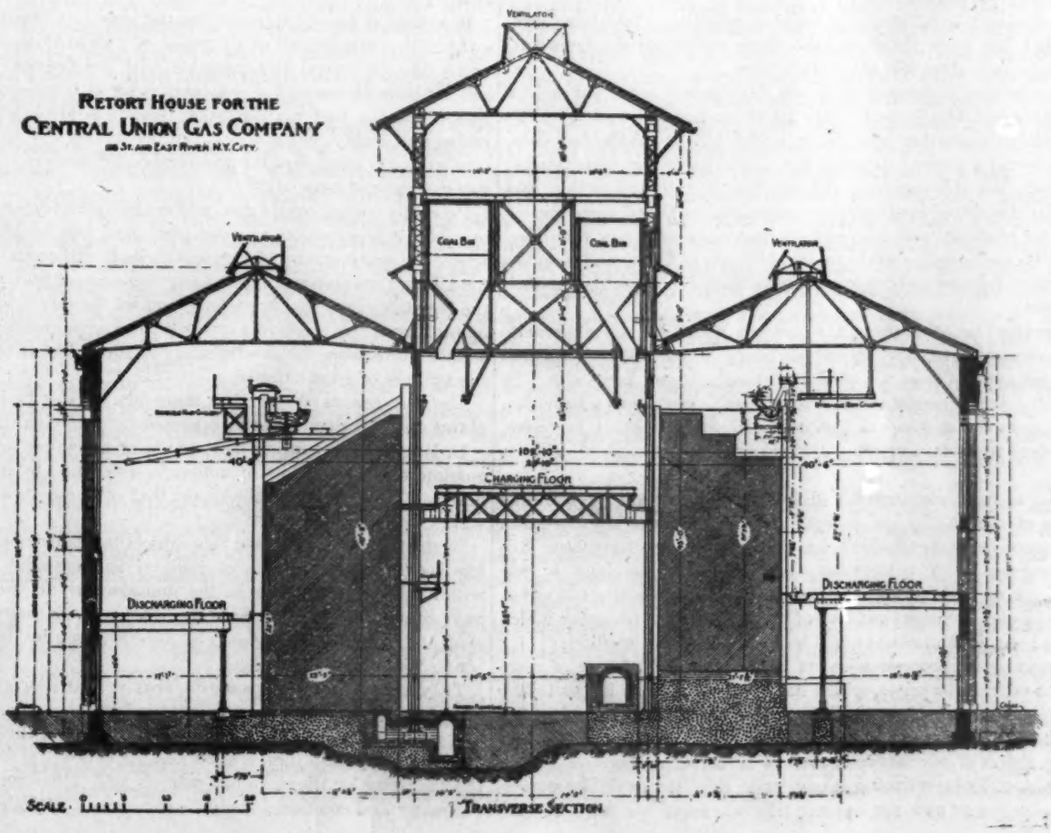
It is expected that each of these large retorts will carbonize 1,000 pounds of coal in 4 hours, and will make, say, 30,000 cubic feet of gas per day, or 250,000 to 275,000 cubic feet of gas per day, per bench of nine's, in actual practice.

The writer took up the subject of inclines several years ago, and endeavored to introduce them in the works of the Company of which he was Manager; but considerations growing out of the patent rights, etc., caused delay, and 5 years ago the sole management passed out of his



CHARGING AND DISCHARGING FLOOR PLANS

RETORT HOUSE FOR THE
CENTRAL UNION GAS COMPANY
ON 21ST AND EAST RIVER N.Y. CITY.



TRANSVERSE SECTION

hands by the sale of the plant. As the result of investigation into the merits of the system, he was favorably impressed with the German setting, except in the length of the retorts. These, he insisted, should be not less than 18 feet long, and as large in section as experience in Germany had determined was practicable. Influenced by this demand, retorts 18 feet long were tried at Posen, and made so favorable an impression that the Stettin people made an acceptable offer to our Company, which had the prompt approval of the engineers of the parent Company, and, as has been said, the work is now underway.

In view of the difficulty of properly ventilating a retort house, which becomes greater as the quantity of coal carbonized increases, and which is a matter of first importance in a house of inclines in which more than twice as much coal is treated in the same area as in a house containing an equal number of horizontal retorts, we suggested a design for the retort house which has been adopted for the one to be erected. We believe that it will be found by experience to be admirably adapted for coal gas manufacture and also economical in construction. I give you as a part of this address two views of the proposed building, in which it is expected to make, when all the settings are in use, over 2,500,000 cubic feet per day, or 110,000 cubic feet per day per man engaged in handling coal and coke, using in the generators 11 to 14 pounds of coke per 100 pounds of coal carbonized.

These works being on the water front, arrangements will be made to take most of the coal directly from the boats into the bins over the retorts, the coal shed being ussd for storage of emergency coal only. At this plant, which will in a few years send out 8,000,000 to 10,000,000 cubic feet per day, apparatus for the expeditious and economical handling of coal and coke will be installed, as will also the most improved machinery and apparatus for condensing, purifying, etc.

There has been a strange conservatism and lack of interest in this country in reference to inclines. While it is true that they were experimented with in St. Louis 20 or more years ago, they were only adopted in a practical way at Louisville, Ky., and at the works of the Kings County Gas and Illuminating Company, in Greater New York, in the latter part of 1899. I understand that these benches are now in successful operation.

Benches of inclines were put in use by many of our English brethren more than a decade before this, and in many cases repeated installations have been made. There are now more than 10,000 inclined retorts in use in the British Isles.

In Germany and Austria they have been very generally adopted for many years, and quite as many are now in use in these countries as are used by the English gas makers.

There is, of course, a difference of opinion as to the value of inclines, and I am glad that we will have a paper from one of our members stating his objections to the adoption of the system.

The invention and development of the Welsbach burner put us in a position to hold our own in most branches of commercial and domestic lighting, and to push our business into the almost unlimited field, hitherto neglected because unappreciated, of the patronage of persons of small income. For this business, and for that equally important and only partially developed business sure to come to us in the use of gas for power and for cooking, coal gas, with its heat units and low manufacturing cost, is, we believe, to take on its old time position, and to again lead in point of volume its now known to be friend and oft time associate, water gas.

In this connection, the present disastrous strike of the anthracite miners has demonstrated the almost necessity of including both coal and water gas apparatus in all plants of medium and large size. In fact, it is difficult to overstate the value of such practice as a provision against emergencies, as a means for controlling the market for coke, and as a source for obtaining gas making material in such a crisis as the present.

Provincial as to environment, and seemingly protected by it, lulled into a sense of security by the acceptance of a generous appropriation of the unearned increment which has come to all who have been intimately associated with enterprises connected with the land in our growing cities, or with industrial pursuits, we have been short in enterprise, long in conservation, and out of touch with that necessity which always has been, is, and always will be the mother of invention.

In the coke oven process, with its tremendous advantage of association with other enterprises, which has amply proved its fitness to live where wisely constructed, capitalized and operated, abroad and in this country, and in the system of inclined retorts, proven to be a decided advance by scores of our less conservative brethren in England and on the continent of Europe during many past years, we have the suggestion, the experience and the opportunity wherever we may be confronted with the necessity for extension, as is the case with most of us, of arranging for a *permanent prosperity*.

There are, of course, among you some who are associated with communities thought to be too small to warrant the adoption of the systems referred to, notwithstanding the fact that inclines may be used to great advantage in small works.

In such places all the public utility properties not owned by the municipality should be under a single management. Under one head such properties would have the suitably rewarded services of men who, if new to the situation, would, if deserving, adapt themselves to the new environment, and their best efforts would be given to secure better management at less cost, better services at lower charges, and better results generally.

Too often our people have failed of the reward which should go with long service, because they have failed to grasp, or even to see, the possibilities in the opportunity which they have been living close to for many years.

The trust idea—the concentrated control and management of several properties of the same sort—which is now influencing so many lines of industry in our country, found practical expression and illustration in our business many years ago. Many persons have grave apprehensions as to the effect on the welfare of the people at large of the great aggregations of capital for the control of the manufacture in a few establishments, and the supply of goods necessary to modern life, by allied transportation facilities. We must, however, all agree that such control as applied to gas companies, restricted as they are in their operations to localities, will prove to be a signal benefit to both consumers and capitalists.

The ownership or control of many companies by a single organization, affording opportunity for a comparison of results, for classifying details, for experience in the selection and use of men and machinery, and of improved business methods for a broadening effect upon local managers of the pressure to keep up with development in all lines and to make advance in matters hitherto neglected, has done more to stimulate our workers and to put our properties upon a safe basis than all other influences combined.

While our Association will grow in membership with the growth of the country, the number of singly owned companies represented at our meetings will, at least for some time to come, decrease, and this notwithstanding the trend towards municipal management. This subject, which in spite of our prejudices has two sides to it, is gaining the attention of the public and is winning advocates here and there throughout the country.

In a state of society approaching the ideal, we believe that municipal ownership, with control of all public service utilities, such as gas, electricity, etc., is logical and desirable. In the present state of society it has not been demonstrated a success as far as is known, probably for the reason that the best management, which is always the expression of brains and ability, has not found sufficient reward in government service, and also because of the undesirable influence of incompetent official supervision and association.

Privately owned companies, where ability and enterprise are rewarded by added compensation to managers, and just profits to owners, and where the merit system is found at its best, will doubtless hold their own for a long time to come against any demand for public ownership; but the best safeguard which we have against this seeming trend of public opinion is our own conduct towards the communities we serve, which should result from the careful study of the interests of the public from the attitude of good citizenship.

The last census shows that there are in the United States 23 gas plants and 278 electric plants operated by municipalities.

In Massachusetts, up to 1901, 62 places had taken up the serious discussion of and some sort of action in reference to municipal lighting plants. It appears from the report that of these 18 are now operating works, either gas or electric.

In the free discussion that this subject has had, where such discussion has been permissive, men of judicial temperament who have served without pay or otherwise in the management of municipal property, have contemplated with regret the wholesale defamation of public officers, and of the administration of public trusts by men chosen by the people for such work.

They know, however, as we do, that as a stream cannot rise above its source so all municipal government is but the expression of the mental and moral attitude of the property owners and of the voters of any city. This is so apparent that it takes but little intelligence to determine, by the character of the churches, schools and other public buildings, the character and condition of public places and thoroughfares, and by the

character of the public amusements, just what measure of ability there is in the people for self-government, and just what demands for good service and equitable rates they will insist upon for such from public service companies.

As engineers and managers we know something of the present relation of actual investment and of capitalization; and the most careful consideration of the relation of the two, as well as the interests of the community served, becomes necessary if we are to maintain a friendly attitude toward our respective municipalities. It must be constantly kept in mind that we are quasi-public corporations, and it should be our effort to secure the co-operation of the municipalities we serve, instead of allowing them to assume a defensive attitude, as is too often the case, resulting in damage to our interests in the shape of burdensome taxes and restrictive measures, which as a result increase the cost of operation and often impair the earning capacity, or on the other hand make impossible a reduction of the price. This is a large subject, appealing as it does to all classes. It is interesting to the engineer and to the manager, suggesting to the one the importance of low cost production, and to the other a mutuality of interest in all business relations with consumers.

I suggest that a committee of five, one from each section of the country, be appointed to secure, by requests from members of the Association, such useful information as to laws proposed or passed, and as to the character and result of discussion, if any, in cities, etc., in relation to municipalization.

In this connection we are all largely interested in the subject of taxation. We are suffering from a too general impression, correct some years ago but now unfortunately not correct, that our business is abnormally lucrative; and we are also suffering, so far as this subject is concerned, because of the old-time great mystery, and the present time half mystery and fear of intelligence as to the results of our business.

We should, of course, bear our proper share of the cost of government. It is unfortunate that too often we are compelled to pay more. It should be our effort to give the subject judicial treatment, and to protect our interests by timely vigilance and the use of all fair methods of taxation and of the adoption of them in practice. This subject will be ably treated in a paper to be read to this convention.

As our plants get to be known and are discussed by promoters and investors (changing owners as so many have with readjustment of bond and stock issues), conservative managers are looking to the establishment of State Gas Commissions and to that judicial treatment which will safeguard our properties against senseless competition and reckless exploitation. The time has come when we must look the situation squarely in the face and devote our best efforts as we have the opportunity to adjust ourselves to the rapidly approaching time when we must be content with an assured earning capacity equal to that secured by conservative management in other lines of business.

In order to have this earning capacity assured protection must be afforded against attack by speculative interests, evil legislation and municipal assaults by corrupt politicians. It is probable that this protection can never be secured except by a State law, and we should all welcome legislation which would place our property on a sound financial basis, in exchange for which would be demanded the fair treatment of the public and a just division of profits, all of which we are professedly striving to give at present without any security as to the future. Such co-operation with State governments would it is believed do more to prevent municipalization of our property than any other line of action.

In the estimation of many thoughtful men the time has arrived to secure protection through the establishment of State Gas Commissions, especially in our older States. I believe that the best interests of all companies supplying limited populations will be served by the creation of such commissions.

The wasteful competition which we have been so generally obliged to face, due to the installation of electric light plants, has been wisely met and disposed of in many instances by the acquisition of such plants, and the conduct of the light, heat and power business by a single management.

It is safe to say that the managers of such united plants have had the stimulus of the wonderful development of machinery and apparatus for generating the electric current and adapting it to the various uses to which it is now put. I venture to say that the study of electricity, as applied to practical purposes, has had during the past several years the close attention and study of more bright men in every part of the world than has ever before been claimed in the same short space of time by any other subject. In the wonderful development which has resulted, American genius and American capital have easily held their own, The electric current has been greatly cheapened, and while it was esteemed a luxury a short time ago it is now a rival to gas for light and power among a large proportion of our population.

It is likely that nearly the maximum efficiency, and approximately a standard design, have been reached in electric generators. There is, however, a wide field for reduction in the cost of manufacture and distribution by improvements in steam apparatus, the adoption of large units, and the increase in number of consumers in a given territory, as well also through the building up of a class of business which would give better load conditions than those under which lighting stations ordinarily operate.

The school of correspondence conducted by the Association, through the generous aid of some of the broad minded men connected with our industry, is the most serious and intelligent effort of the kind in the world. If the Association had no other work this alone would commend it to all thoughtful men who have outgrown the influence of the provincialism which unfortunately goes with a business which by its nature is confined to a neighborhood.

A perfect system of the kind has not yet been found. It may seem to some to be too technical and to others too elementary; from those who for any reason are not in sympathy with it no worthy criticism has been received. The mere mention that there are such will compel regret from most of you. As the work, like all good work once started in these Catholic times, will be sure to have the continued support of most of our best members and friends, it is to be hoped that any opposition will be open and above board, so that it may sooner come to an end, and the work have such unanimous and generous support as to enable all who seek to secure its benefits.

We urge the most strenuous efforts in behalf of our educational fund and generous subscriptions so that the work may not only be kept up, but extended to those now excluded. Whatever may be said about educational work in any right direction, in the criticism of its methods and its scope, all thinking men must agree as to the wisdom and necessity of it. It is particularly important that every advantage should be extended to men who have the sturdiness of character to determine to win knowledge while following their daily pursuits. One has only to study the history of the business to learn that many men have given character to it, and have promoted its best interests by invention, skill, and large business ability, who did not have the advantage of technical education.

There is no more interesting reading than that which has been inspired by the tremendous material development of the country in recent years, and which is descriptive of the great "Captains of Industry," who for the most part did not have the education of the university.

Of these men, some might have had the free education which our wise Government gives to prospective soldiers and sailors, and some might have had free scholarships in our colleges. Fortunately for the country they saw their duty aright, and took up the burden fate laid upon them, winning unaided an all-around fitness for the business, a competence and a general acknowledgment of ability.

Fortunately for investors and consumers, the number of technically educated men connected with our industry is rapidly increasing. But there will never be a time when men of character and determination will not be able by self-help to take their place in the front rank as engineers and managers. To encourage and assist such is the part of wisdom, and the aim of our correspondence school.

The city of London, and the several Guilds, support the "City and Guilds of London Institute." In addition to its other functions the Institute examines those who apply in the subject of gas manufacture, on proof that they have passed in certain elementary subjects, and grants certificates of two grades, the Honor Grade, and the Ordinary Grade. The examinations are held in May of each year, in all the principal cities of the Kingdom.

The use of proper bookkeeping and accounting has been a wonderful stimulus to all of us, and has saved many properties from disaster. We are compelled to acknowledge an indebtedness to those organizations in control of a number of our companies, and to those individuals in our business who have done such good work in the preparation and use of systematic accounting methods. There has been an amazing amount of neglect and carelessness in bookkeeping methods, and there are many companies even now that are doing business with little or no system that makes for intelligence. Close scrutiny as to development all along the line secures an equipment for and creates an ability to meet any condition that may come about through circumstance or accident.

Great praise is due the Committee on Systematic Account Keeping

for the very valuable report submitted at the last convention. The committee will present its completed report at this meeting.

Of all the problems that have arisen in the past to add interest to the gas manager's life there is probably none which he has taken up with a greater sense of impotency than that of the electrolytic corrosion of his mains and services. He feels at the very start of his investigation that he is dealing with a subject entirely foreign to him, and that his information must come, not from his own past experiences but from a body of men who are themselves dealing with a comparatively new agency. A very casual examination of the literature of the subject will convince him that the electrical experts are far from united in opinion.

During the past year and a half, the question of electrolysis has received a great deal of attention from European gas managers, because (owing possibly to the so called "American invasion") a large number of street railways operating under the single trolley system have been projected and installed. This is especially true of England, and the mass of expert testimony given before Parliamentary and other committees makes interesting, if somewhat unsatisfactory, reading.

Our English brethren are more fortunate than we are in that they have the Board of Trade, a body with authority, to which they may present their side of the question and receive at least an unprejudiced hearing. This Board, in 1893, drew up a model clause to be incorporated in all franchises granting the right to lay trolley lines. The requirements are such that trolley lines operated in conformity with them should cause but little damage by electrolysis. That the stray currents from these lines will eventually corrode the piping systems is the belief of the majority of gas engineers; but with few exceptions it has been impossible to secure the insertion of an additional clause which would place the liability for damage resulting from this corrosion on the trolley companies.

In this country we have no branch of the general government which at all corresponds with the English Board of Trade. The granting of franchises is almost entirely in the hands of the local authorities of each community, who have the right to impose such conditions as they may see fit. In many cases, owing to the desire to secure increased transportation facilities, rights are granted which do not adequately provide for the protection of other interests. It seems to me that a subject of such great interest to the whole industry should receive some formal recognition from our Association. I should like to see a committee appointed which would make a careful investigation of this whole problem, and render a report in such form that it could be used by managers in framing arguments for presentation before their local authorities.

In an estimate of the possibilities of the future of our business it is assumed that it will hold the field permanently; that while we may lose somewhat to electric lighting in the patronage of the well-to-do, the much broader and better domain of the multitude is open to us and ready for occupancy. We have learned to appreciate the value of a great many small accounts, and the necessity for a sufficient volume of business to make the cost per 1,000 for fixed charges as low a figure us possible.

There are good reasons for believing that the make of gas *from bituminous coal only* will increase rapidly from this time. The apparently inexhaustible deposits of and widespread areas from which such coal is mined and our efficient transportation facilities insure the continued supply and low price of this material.

Inclined retorts, of practicable lengths as required, with full-depth regenerative furnaces are adapted to most of our works. Put up as suggested, they represent pretty nearly ideal conditions as to labor costs and control, with marked economy in fuel. They represent the only demonstrated improvement in apparatus for carbonizing coal since the beginning of the business.

We represent one of the greatest and most widespread industries of the country, and of the times in which we live. With the large number of technically trained men who have come among us with young and vigorous minds untrammelled by tradition, and with our efficient practical engineers and managers, we may confidently look forward for the exercise of that genius, enterprise and thoroughness in the development of our business that is so characteristic of our countrymen.

In closing I plead for a continuance of and a growth in that broadness of spirit that has characterized our Association's work; for a continuance of and a growth in that spirit of enterprise which has come to most of us as the result of enforced competition with other forms of lighting, and for the putting behind us of all mystery, or half-mystery, as to methods or results.

During the past year the hand of death has been laid upon the Association, lightly in point of numbers, but heavily as regards the quality of those whom it has taken away.

Henry Morton, one of our most distinguished Honorary Members, died May 9th, 1902. Elected to membership in 1878, he had shown his interest by delivering, at several of our meetings, lectures on the subject of lighting, which he could treat with a knowledge born of experience derived from experiments with almost all the known means of illumination. A man of wonderful versatility, he was almost equally well qualified as an archaeologist, a mechanical expert and an educator, although he was chiefly known to the general public in the latter capacity, through his long service as President of the Stevens Institute of Technology.

William Cartwright, who died March 8th, 1902, was one of the original members of the Association, and his death narrows still more the already small circle of the survivors of those who planted, in 1873, the seed from which has grown the Association as it now exists. Throughout his active business life he was a constant attendant at our meetings and showed his interest by frequently participating in the discussions.

William L. Elkins, Jr., died March 14th, 1902. His connection with the gas business was principally on the financial side and did not bring him prominently into Association work.

Edward H. Jenkins, whose death occurred June 23d, 1902, was well known to almost all the members of the Association. His geniality and whole-heartedness insured him a warm welcome at all Association meetings, and his untimely death came as a great shock to many of us, and none the less because due to an apparently avoidable cause.

[Communicated Article.]

How Many Purifiers Should there Be to a Set?

Not many years ago four would have been the universal answer to this question. More recently, with the use of water gas and of the system of divided flow in each box, there has been a tendency to install sets of two boxes only, the capacity of each box in respect to the maximum make being ample to allow gas to pass through one box only while a change was being made after the gas showed dirty at a certain point in the second box. The location of this testing point would naturally be determined by experience, and it would be as near the outlet of the second box as would be safe, in view of the necessity for this second box caring for all the gas while the other was being changed. The use of two boxes as compared with four saved in installation cost, for by divided flow as much duty was obtained from half the floor space formerly required

Whether using two or four boxes the same idea has been in the mind of the gas engineer, to determine upon a certain point in the process of purification at which to test for dirty gas and then change the first box accordingly; all this without knowledge as to the further ability for removing H_2S prior to revivification possessed by the oxide of the box changed. This point, as to the determination of how much more H_2S any box might be able to remove before changing, as shown by the percentage of H_2S it was taking from the gas at the time of changing, was first raised, I believe, in a paper read by Mr. Carroll Miller before the New England Association of Gas Engineers, entitled, "The Proportion of Sulphur Removed in each Purifying Box."

The tests were described, and the idea of basing changes of purifiers on these tests originated in the Philadelphia gas works. It is a question whether the superiority of this new method of testing has been duly appreciated by gas engineers as a whole. Its effect upon the number of boxes to be used in a set would be to increase them. The exact number might be subject to variation at different works, being dependent upon the relation between operating and first costs; that is, the value of real estate and the amount of space available for purifiers at any works might make it more economical in practice to have fewer boxes in a set than the number which would allow of a box being kept in service until it was removing but a small percentage of H_2S. Local considerations always affect the application of general principles, but the point here contended for is that in designing sets of purifying boxes for any works the number to be used in each set should be determined (with full knowledge of the H_2S content of the foul gas) after consideration of the full number necessary, in order to allow the first box to stay in use, not as at present, until the outlet of the third or the middle of the fourth shows dirty, but until the first box is removing very few grains of H_2S. The number decided on should be less than the number thus found necessary, only in case the interest on investment for the extra boxes was greater than the money saved in operating expense due to increased duty of oxide per change.

It seems quite possible that purifiers in sets of six or more will become common in the future.

On the Use of Gas for Warming Inclosed Space.

By Dr. W. H. Birchmore.

How best to heat inclosed space, with economy and success, by means of illuminating gas used as fuel, may at the present time be looked upon as the task which confronts the men interested in the various applications of this product of chemical industry, or, better, industrial chemistry. The problem of the use of gas as an illuminant, thanks to the mantle, is shelved, if it be not indeed actually solved, as many of us think, and now the problem of using gas as satisfactorily as a source of heat as it is now used as a source of light demands solution.

In a way gas has been used as a source of heat ever since the Bunsen burner was invented, but at the present the problem of the use of illuminating gas for heating inclosed space is far from solution. The fact seems thus: No satisfactory burner has yet been devised, and a scheme for using the heat developed by the present burners remains among the problems of an uncertain future.

This subject, the heating of inclosed space by the use of illuminating gas, has two distinct aspects for those interested in such questions, one presenting the form of a problem in physics, a matter in pure science and nothing more, which may be called the chemical and physical aspect of the question; and another, demanding the attention of those who make illuminating gas as an article of public utility, which may properly be called its commercial aspect. Either or both of these may be considered from many standpoints; and alike from the viewpoint of the physiologist, the chemist, and the man of affairs, the situation is very unsatisfactory indeed.

The physiologist rightly enough demands that the work shall be done in such a way as not to endanger the public health, the man of business requires that the process shall in cost compete with every other system of warming the inclosed space, for the owners of the gas works must have the interest on their money, and the housewife's cares must be diminished by the amount of work required to care for furniture, glass and linen at this present time; and it must be admitted that in the development of the industry not one of these demands is met.

Heating with gas as at the moment managed is not absolutely without risk to the public health, and when made perfectly safe under the present conditions the price becomes apparently prohibitive. The gas maker commands a view of the whole situation and seeks a remedy for the difficulty, but sees none by which either one of its demands can be met to the satisfaction of all concerned. The stumbling block in the path of success is the usual one appearing in such cases, viz: "The problem has never been stated in such a way as to make the final solution possible." This objection seems nearly or quite justified, for although the men making "gas stoves" have put thousands, yes, tens of thousands on the market, yet not one of these manufacturers has taken the trouble to work out the proper basis for the expenditure of labor, not one has investigated the question as a matter in pure science, nor has he caused others to do so, or if he has made such investigation he has not used it for the benefit of the buying public.

As a result of this state of things we have the whole medical profession doubtfully accepting, or mildly disapproving of, the use of gas for heating inclosed space, except as a substitute for the "fire sticks" in the open fireplace, in the shape of the absurdly named "gas log," whose faults are at least as numerous as its virtues. Others, chiefly manufacturers of stoves with flues, basing their protestations on this well-known opinion of the medical profession, are declaring with most self-interested emphasis, although pretending great anxiety for the public weal which is obviously only a pretense, that "If the boards of health would do their whole duty they would suppress all the gas stoves without flues, and would do so at once."

This protest by physicians and gas-stoves-with-flues makers is alike mistaken caution, and a splendid, a shining example of that which the man in the street correctly calls "rot." The fact is that, if the gas is actually burned, is fully oxidized to H_2O and CO_2, water and carbonic acid gas, there is really no more sense in protesting against a gas stove without a flue, which shall carry combustion products to the chimney, than there would be in protesting against a Welsbach burner without the same inconvenience. In both cases the products of combustion escape into the room, and in this room the products of both are alike harmless, or can be made so with a minimum of trouble, which trouble the user of the light as a rule takes for the sake of his own comfort; and this same trouble the user of the stove may, for the same reason, be trusted to take in like manner for the sake of his comfort. The people at large are not fools, and they can be trusted with the combustion products of the gas burning stove as well as with those of the gas burning light, provided these combustion products are in any rational qnantity. The real difficulty and danger for the users of the gas stoves, for the difficulty and danger both exist, are to be found in the inexcusably large amount of gas burned to produce the result attained; but it is the purse of the user rather than his person which is endangered or injured thereby.

The Theoretical Problem.—In the latitude of New York city certain facts in regard to the average temperature are known to be true, and, slightly magnified by climatic differences, they are true in Augusta, Me., and St. Augustine, Fla. The climate of the one requires a somewhat greater expenditure of gas to obtain the requisite amount of heated air, the climate of the other somewhat less; otherwise they do not differ, and that which is true in New York city is equally true in the other two places. In every city in the country the same facts are true, and the more pronounced the climatic variations from day to day, so much the more important are the factors herein set forth as influential in determining the result.

Three factors constitute the terms of all proportions and equations in regard to this question, and the problem may be stated as follows: "Given a fuel with a certain capacity for changing chemical action into heat, and a medium with a certain definite capacity for conveying heat, which medium must also be used for respiration, how shall this capacity be utilized without inconvenience to respiration, and with a minimum loss of heat?"

The fuel value of the average illuminating gas is not far from 165 calories per cubic foot. If we consider the specific heat of air to be 0.3066 calories per cubic meter, and reckon the cubic meter as equal to 35.2 cubic feet (which is near enough), we find that the specific heat of air per cubic foot is about 0.0087 calories.

By a very simple calculation we can determine the amount of heat needed to warm a cubic foot of air from the freezing temperature (32° F.) to "the comfortable temperature," so called, 72.5° F.

$$72.5° \text{ F.} - 32.0° \text{ F.} = 40.5° \text{ F.} \times \tfrac{5}{9} = 22.5° \text{ C.} \times 0.0087 \text{ calories} = 0.19598 \text{ calories} = \text{H.}$$

For convenience in calculations this quantity is commonly stated as 0.2 calories, which is near enough for all practical uses.

The Calorific Value of a Cubic Foot of Gas.—The statement just made that average illuminating gas will yield 165 calories per cubic foot has no meaning unless it conveys some notion of what such an amount of heat will do. If we reckon the value of H as 0.2 calories, one cubic foot of illuminating gas *perfectly burned would, if all the heat were utilized*, raise $165/0.2 = 165 \times 5 = 825$ cubic feet of air from 32.0° F. to 72.5° F.; that is, would raise 825 cubic feet of air from the freezing point to the highest temperature which can be endured for any length of time in a closed room without discomfort, even if the respiration supply be ample. Under these conditions the traditional "five feet per hour," if employed to the best advantage, would, therefore, heat $825 \times 5 = 4{,}125$ cubic feet of air through 40.50° of the common thermometric scale.

A room 16 feet × 12 feet × 8 feet requires 1,536 cubic feet of air to fill it, if it has no other contents, and if the "five feet per hour" were used for heating under ideal conditions it would heat all the air required for the combustion of the gas, the respiration of the usual number of people and for the warming of two such rooms within the mean limit of temperature commonly found in New York city.

The statement, although true, must be qualified in practice in two ways. The people in the room must breathe air containing not more than 0 005, say 1-200th part of carbon dioxide, or they will be discomforted, and the gas also must be supplied with oxygen, which means still more air, and the products of combustion and respiration must both be removed. This complicates the problem, complicates it so much that to obtain a satisfactory solution the examination must be exhaustive.

It is not my intention to carry the analysis to any tedious length, but to show the bearing of some factors which seem to me not without interest.

The Amount of Air Required by the Gas.—Each unit of the average illuminating gas may be said to require at this given temperature, and at the usually actual but not usually conventional temperature pressure relation, 4.7 units of atmospheric air, and the result of the combustion will be 1.28 units of watery vapor, 0.5 of a unit of carbonic acid gas and 3.7 units of nitrogen. To dispose of the 5 cubic feet of gas which we propose to burn will require 23.5 cubic feet of air, and the product will be 6.4 cubic feet of watery vapor and 2.5 cubic feet of carbon dioxide and 18.5 cubic feet of nitrogen. By one of those curious miscomprehensions of facts, which reappear every little while in the popular conceptions of scientific matters, the idea is prevalent that ventilation is

needed in order that the carbon dioxide may be removed. Than this no greater misconception or more absurd blunder is possible; carbon dioxide can be gotten rid of easily enough in half a dozen ways beside "ventilation," but nitrogen can be removed in no way except by sweeping it out with more air, and while we measure and carefully gauge the amount of the CO_2 we do this in order to see what amount of oxygen has ceased to be useful and how much the nitrogen now finds itself in relative excess. We may assume, therefore, from the hundreds of experiments which have been made, that if 100 cubic feet of air per hour per person are added, potentially at least, enough oxygen will have been added in addition to obvious precautions. From these figures which are fair enough, may be rather too fair in view of the large waste factor allowed, we may construct the following:

Table Showing the Distribution of Certain Factors.

	Cubic Feet.
Original air contents of the room, 16 ft. × 12 ft. × 8 ft.	1,536
Air required for respiration need per hour, assumed to be....	100
Air required to burn gas required for heating.....	23.5
Total air supply which must be heated.....	1,659.5
To heat this amount of air from 32° F. to 72.5° F., with the assumed consumption 0.002 cubic ft. gas for each cubic ft. of air heated requires...	3.32
To maintain the temperature of the room contained air, on the assumed renewal of 125 cubic feet per hour, would require on the same basis, which probably represents a maximum...	0.250
But since we may confidently assume that the room will receive its ventilation, not from the outside but inside of the house, at a temperature much higher than freezing, we are justified in reducing this quantity by at least ⅗ths and placing the "heat of renewal" at.....	0.150

These amounts agree so exactly with those of experiments that they may be acted on as a basis for estimate.

The Amount of Gas Actually Used in the Work Done.—From the above estimate it may be laid down as a fundamental in the discussion that the demand for heating an average room containing 1,536 cubic feet will be something less than three feet, and that the demand for maintaining the temperature will not be more than 1 foot per hour, under present conditions even, if no heat is needlessly wasted. But if the room is made with more care the demand will fall to 0.0011868 cubic foot of gas for each cubic foot of air heated from 32.0° F. to 72.5° F., and this gives 2.3697 cubic feet in place of 3.319 cubic feet, and 0.14832 cubic foot in place of 0.250 cubic foot, and the 60 per cent. average becomes 0.088016 cubic foot, which limit has not been attained, but has been approached in experiment.

The difference between this statement and that of the air vitiated and gas consumed is fully recognized, but there is no need for saying that any consumption more than this is needless; 0.250 cubic foot will maintain the temperature, if any sort of care is used. There is a certain portion of heat converted into work in the process of ventilation and another and much larger portion than one would think is lost in heating all outdoors by the excessive window loss.

From a series of experiments made with all the care possible, it is my opinion that an equation may be constructed representing this quantity. The window loss, which is expressed in terms of the temperature within and without, the dryness of the air, of course dependent upon the temperature, at least so far as the outside air is concerned, and the area of the windows and their area divided by the area of the walls. Experiments made under conditions of control have given results within measurable distance of correct (calculated) values. I am also able to say that when windows are made double this radiation from-the-window loss, which is nearly as much as all the other losses together, reduces so much that it may be neglected; "vanishes, by reduction to zero," as the mathematicians say.

The Causes of the at Present Relatively Large Consumption.—In present practice one can plainly see that this theoretical duty is not attained, and when called upon to give an opinion as to the amount of gas to be used for heating a given room, a truly absurd safety factor must at present be introduced which converts a fuel, by nature one of the most economical and cheapest, into one of the most expensive. This "safety factor" is the handicap upon the use of gas, and I positively affirm that were it eliminated no one would be found who could consent to use any of the other methods in vogue for heating as a substitute for gas, and this simply on the score of expense involved, even if the inconveniences arising from the use of coal, for example, were a thing bygone. The causes of the large consumption are: First, the heat lost by way of the windows; second, the design of the stoves, at present the chief source of waste—for these, instead of heating an enormous volume (relatively) of air, only 2° or 3° above the desired temperature, now send out but a small volume much superheated; and, third, the ridiculously inadequate control of the amount of gas delivered to the burner for combustion.

The first loss, that by way of the windows, can be saved by the use of double sashes, but these double-sashed windows can be gained only by the education of the people and the architects. As the architects are more intelligent and less numerous than "the people" it would be well to begin with them, and so much influence has fashion that were one firm of architects in good business to build a house with double windows, and the sort of ventilation a gas heated room requires, the rest of this clan would find 102 reasons for heating other houses by gas and for putting in double windows with both sash sets freely movable.

The third point can be secured by means of a thermostat put in the line of the tubes giving the gas supply to the stove. The best pattern would be an ornamental one, designed on the plan of that used in laboratories, placed on a shelf or a table anywhere convenient, and connected with the tube which carries the supply to the stove. Such a thermostat can be so perfectly adjusted that the room temperature can be held within one-fifth of a degree Centigrade, one-ninth of a degree of the usual scale, and while among those who would be benefited the physicians alone would fully understand the tremendous meaning of this fact as preventing the annual loss of usefulness from illness among adults, and the mortality among children, yet every person would appreciate the pleasure of being in a room which is never hot and never cold, in which the air is always pure and always comfortable without the nerve-racking dryness of the furnace heated air, and the neuralgias and pneumonias, due to the irritation of the air passages, arising from the still worse air of the steam heated rooms. Such a perfect control of the temperature as is possible when gas is used for fuel makes for economy also, and it is only when such a control is maintained, and it can only be maintained by the use of gas as fuel, that we are getting all that is ours to gain in the enjoyment of life from the energy which is placed at our disposal by the makers of illuminating gas.

The Gas Stove.—The second factor listed but now was given as the apparatus in which the gas is burned and with which the air is heated. No words of mine can express my astonishment every time I enter a salesroom and examine the appliances for sale under the name of gas stoves. The utterly untoward exhibition of thought expended in the wrong direction, the ignorance displayed in regard to the elementary principles of physics, which must underlie the solution of the problem given the designers of gas stoves to solve, make me wonder if the divorce between the knowledge of the laboratory and the ignorance of the workshop can be more complete than it now seems to be. One day last winter I entered a room 12 ft. × 8 ft. × 8 ft., in which was a gas stove, so called, which was burning as the meter showed 20 cubic foot of gas per hour. This stove, furnace rather, was red hot, a match was fired by its radiant heat at the distance of 8 inches, the combustion was so bad that the burners, badly designed Bunsens in pattern, actually smoked, the room temperature was below 70° F. at 4 feet from the floor, but at the slit in the window, it was down from the top 2½ inches, "to give me a chance to get a breath of fresh air," said my friend, the thermometer which I had with me read 160° C., and would have gone higher could I have remained on the table long enough to get the temperature without fainting, for respiration in such an atmosphere was impossible; 160° C. is 320° F. about the temperature of a baking oven. While this is presumably an extreme case there is no doubt but that the combustion gases always leave the gas stove at a temperature not much if any less than that of boiling water, and experiments show that the temperature is usually very many degrees higher, and who is there but knows that the temperature of the shells of these veritable furnaces is such, that any person touching one of them would be burned. Such a condition of things is in each and every regard contrary to that which should be, and one involuntarily asks, "Is there any reason why conditions so totally at variance with common sense should be found dominant?" and if asking thoughtfully surely answers his own question by saying "Such a notion is contemptible." Wherefore then do we find such conditions everywhere prevalent? Perhaps because no one has troubled himself to formulate the problem for solution.

Believing that this is the true reason, I give the problem in terms, and make the statement that laboratory experiments, that is, experiments made where every factor modifying the result can be controlled, or if not controlled can be measured, show positively that the theoretical duty can be attained to within a margin of 2 per cent. This 2 per cent. seems to be lost in the chemical action, or in the friction of the circulating air, probably this last. It may interest some persons to know that the analysis of the problem was carried, by designed experiments with

the results first calculated and afterward verified, so far that it was possible from these solutions to determine the amount of heat used in the work of air circulation, even the loss of energy from the water due to the combustion process checked out, but the 2 per cent. loss of heat always escaped me, as I have mentioned before. It may have been that I underestimated the heat used in warming the walls of the inclosed space, as has been suggested to me, but I think it was transformed into motion, may be inter-molecular, in some unknown way.

The Proper Theory of Gas Stove Design.—Since I have affirmed so positively that the present theory of design is at fault it is only fair that the true system of design should be pointed out, and a way of making a cure of the present faults explained. The answer to the question, "What is the remedy?" can be given in very few words. The gas should issue from a burner sensibly designed and correctly made; the heat of the flame should be made to come in contact with the largest possible surface so that the hot gases may be cooled and the air circulating in the room heated correspondingly; and finally, the heated surfaces should be in contact with so much air that they do not rise in temperature beyond a reasonable height. This divides the process into three parts, into designing a burner for oxidizing the gas; an apparatus for absorbing the heat and conveying it to the air; and third, an apparatus for bringing the air in contact with the heating surface.

The Burner.—The burner which in my hands has proved most suitable is one which can be cut down by the use of an automatic thermostat to the most insignificant flicker without showing any disposition to light back. It is possible that a better design than the one ordinarily used would be a "multiplex," or one resembling a certain burner, so well and so favorably known in chemical workshops. Certainly it is much less complicated than the one I made use of in these experiments. After all the special design of the burner is a small matter compared to that of the other details.

The Air Heater.—The following description explains the design of the heater which up to this time has given me the most satisfaction. By means of it I obtained a higher duty than with any other "radiator," for which very unsuitable word I propose the name "transformer;" for the work actually done is to change the high tension vibrations of the small flame of extreme high temperature into the low tension vibrations of a large quantity of air at a relatively low temperature. This fits very well wtth the facts, for the temperature of the air leaving the "transformer" should never be more than 5° or 6° (Centigrade scale, say 10° F.) above that intended for the room at large.

The outside of this contrivance is a simple cylinder of sheet iron, at both ends are sheets of metal. Joining the two sheets, the bottom and top so to say are numerous tubes, in my most successful pattern 24 in number. There is no magic in the number, but the smaller the size the less rapid the air current within them, and relatively to the area the greater the perimeter and, therefore, the heating surface. Within the drum are three diaphragms acting both as baffles to the hot air and flame from the burner and as conducting plates, joining the inside tubes and outer walls and serving to equalize the temperature of the entire apparatus. The effect of these baffles is surprising. In a few patterns made without them, but otherwise quite like, the stove would be almost cold, while the air gases coming from the flame would be really dangerously hot, so hot, indeed, as to fire paper, while with the baffles in their places no such mischief could possibly result. The central portion of the lower plate always gets very hot, at times it seems to be red hot, but the excess of heat is quickly conducted to the tubes and shell and the temperature of the whole apparatus is equalized. These may be said to be the principal demands upon a consideration of which the design must be founded, and unless these are all completely satisfied no design can be considered as scientifically worthy of consideration.

(A.) The entire apparatus must be joined by suitable connections, so that the surfaces with which the hot and cold air may come into contact shall in every case be all of them as nearly as may be of the same temperature, and the area reached by the air on the one side must be as near as possible to the area reached by the air gases on the other. The underlying idea is that of a surface condenser for a steam engine.

(B.) There must be some difference, 5° C. is ample, between the temperature of the combustion products and that of the atmosphere of the room, so that the combustion gases shall tend to make their way rapidly, more rapidly than the rest of the atmosphere, towards the escape trap into the ventilation flue.

(C.) The "escape trap" which is needed equally for the gas stove and the gas light should be provided by the architect in his design of the room and the chimney flues. Of these A and B must be looked after by the designer of the stove, and the men interested in the extension of the use of gas must educate the architects to do their duty by their clients in respect to C.

There is one thing which we as gas men can surely do. We can put the true statement of the facts before the people, and can tell them and can also show them why gas is so very much more economical a fuel than any other one known for heating inclosed space. We can tell them that with coal as ordinarily burned they utilize only one-eighth in heating a room, in a grate about $\frac{1}{17}$th part is used; in heating by steam with all the attendant discomforts in the way of dry air and the like only a little more than 18 per cent. of the heat in the steam is used; while when gas is burned not less than 95 per cent. finds use and the water, separating from the carbon dioxide and nitrogen by reason of its more rapid cooling, remains behind in the room thus making the air closely resemble that of a warm May morning. In fact this is the secret of the comfort which we find in the atmosphere of a gas heated room. When the heating is properly managed the air is warm, it is not hot, and it has the moisture which should go with the heat. Such an atmosphere has the peculiar feeling we call "balmy," the attribute alike of a May morning, a June afternoon and a room heated by illuminating gas in December. Among methods of artificially heating inclosed space this one alone has the power of counterfeiting the atmosphere of a June afternoon and, given the proper method and machines for using the gas, if a suitable apparatus is used the constitution of the atmosphere will almost exactly coincide. Since all these things are so, let us begin a campaign of education, first among the architects of houses and the makers of gas stoves, and as soon as a stove which meets the demands which laboratory experiments have justified has been put on the market, let us see if we cannot make this product of *our* chemical industry, gas making, as essential for heating as it now is for illumination. To do away with the lung troubles of children, and the neuralgias and nervous headaches of adults, is one of the purposes for which the use of illuminating gas for heating inclosed space is most particularly to be recommended.

About Gas Cookers.

The *Gas World* notes that in a paper by Herr Schöne, of Dessau, read in Cologne before the last meeting of the Rhineland and Westphalian District Association, it is stated that a Bunsen burner consuming 0.525 liter of gas per minute ((1.112 cubic feet per hour) brought ¼ liter of water to the boil in 9 minutes, ½ in 20 minutes, ¾ in 44 minutes, and 1 liter (1¾ pints) in 92 minutes. The consumption of gas corresponding to the 4 cases would be 37.84, 42, 46 and 48.30 liters per 1 liter of water. It is thus clear that with so small a flame, though it is capable of boiling a liter of water in 92 minutes, there is a waste of gas, on account of the water losing heat by radiation and so forth while it is being slowly heated up. It may even be that with too small a flame or too great a quantity of water the supply of heat from the flame and the loss of heat by the water may come to balance one another, so that the water remains steadily warm but never succeeds in coming to the boil at all. If a larger flame be used the water boils more rapidly, and if the consumption be 2.08 liters per minute (4.307 cubic feet per hour) the time taken to bring ¼ liter to the boil is 2½ minutes, ½ liter 4½ minutes, ¾ liter 9 minutes, a 1 liter 16 minutes. The consumption of gas per liter of water would thus be 37.44, 37.44, 37.44 and 33.28 liters. This shows that such a burner is adapted to that quantity of water, 1 liter. These figures apply to the case in which the flame is so adjusted as to present a clear green cone, without luminous tip or any tendency to roaring. If the tip is luminous 41.60 liters of gas is required instead of 33.28, and if there be any tendency to roaring there is again a similar increase in the quantity of gas required. Striking back of the flame, of course, induces a large increase in the quantity of gas required. It is, therefore, important that the flame should be adjustable, so that it may be made to correspond to the work which it has to do.

It is well known that a cooker which works well at the works may give inferior results out in the town, or that one which works well in the cellar may give inferior results 3 stories up. This is explained as being due to differences of pressure in the gas supply; and this leads to the statement that a cooker with fixed non-adjustable parts can only give its best results under a given determinate pressure and consumption of gas. The housewife needs to be able to stew very slowly in earthen pots, to avoid burning the food without any special degree of care, to turn on a slow heat when the food is ready or at the boil, and to use as large a number of pans as possible without having a burner for each. Most of the gas cookers in use are defective in these particulars, and in practice there is a tendency to limit their use to the preparation of tea or coffee or the like, with the result that, on the whole, an inadequate quantity of gas is used by the consumer. Cooking plates with preheated air get over these deficiencies, and in many cases completely replace the coal range, with the result that a satisfactory quantity of gas is used, and the

convenience of the consumers is economically served. The preheating of the air supply has the effect of materially reducing the amount of loss of heat by radiation downwards. The cooking plate is ribbed underneath, and it is found that this increases the amount of heat transmitted by as much as 30 per cent. The full advantages of a hot plate are only obtainable where a number of pans are in use at the same time; and any spare room on the plate may be used for warming the washing-up water while the cooking is going on. When this is seen to the consumption of gas for family cooking may be some 40 per cent. less than it is with an ordinary 4-burner stove.

Round openings on the burner ring are by far the best, and the flames with these may be made quite clear and distinct. The preheating of the air supply makes the temperatures very much higher; and it also makes it possible to admit much more air into the gas without risk of striking back, and thus to insure prompt and complete combustion and concentration of heat for the service of the hot plate. There is also no smell suggestive of incomplete combustion.

Commercial Aspect of the Steam Turbine.[1]

At the Detroit Convention of the American Street Railway Association, Mr. Edward H. Sniffin presented a paper, entitled "The Steam Turbine: Its Commercial Aspect," which gave information in detail of turbine plants now in operation, and discussed the cost of turbine plants and operation as contrasted with ordinary steam plants.

In units as small as 400 k.w., a result may be obtained of 14.47 pounds of steam per brake horse power per hour, corresponding to less than 13¾ pounds per indicated horse power. It is thus evident that moderate sized plants may with the turbine be sufficiently subdivided to give the maximum flexibility of service, with insurance of relay, and yet possess an efficiency heretofore identified only with very large units. Further than this, a fluctuating load is not incompatible with high economical performance. As the units become larger, the turbine is then brought into comparison with the best steam engine practice, where it still preserves its uniform efficiency, and where its practical advantages are no less evident. In a recent instance, a result of 11.7 pounds of steam per electrical horse power per hour was guaranteed on a turbine of 750 k.w. capacity, corresponding to about 10.17 pounds per indicated horse power, which, though the size is moderate, is, perhaps, within the ability of but few engines of any size or type that have ever been built.

Curves were given showing that the turbine requires about 80 per cent. of the space needed for the vertical engine, and not over 40 per cent. of that wanted for the horizontal. The vertical engine compares less unfavorably with the turbine than might generally be supposed, while the horizontal engine curve is about where one would expect to find it. The latter is not carried beyond 2,000-horse power, this type of engine being practically limited in size to that required for the 1,500 k.w. generator.

Another set of curves showed the cubic yards of foundation material required, which was stated to be a more exact and striking comparison. The turbine would appear more advantageously still, if the actual foundations needed for stability had been computed. Instead, the foundations in all three cases were figured at 15 feet depth to give space underneath the engine room floor for condensers, etc., though for large engines this depth is usually inadequate. The only foundation needed for the turbine is that necessary to hold its weight, as if it were a tank or some other stationary affair. It does not even require foundation bolts, there being no vertical or horizontal thrusts to be resisted. Comparing again the 1,000 k.w. units, it is found that in actual foundation volume required the ratio of the turbine to the vertical and horizontal engine is that of 1 to 9 and 15, respectively.

Other comparisons were given on the basis of cost. In the case of foundations, the basis assumed was $7 per cubic yard for concrete, laid. While the turbine seems to average a foundation cost of about 50 cents per horse power, the vertical engine in the more frequent sizes is approximately $1.50, while the horizontal is not far from $2.50, not forgetting that all three foundations are figured of equal depth—15 feet—to provide space below, as before stated. In the instances where special foundation work is required, such as piling or otherwise preparing suitable bottom, or shoring up building walls to enable sufficient depth of excavation, the expense avoided by the use of turbines is obvious.

In a showing of the comparative engine room building cost, the basis assumed was 15 cents per cubic foot of space inside of walls. The building cost for the turbine is about one-half of what is required for the horizontal or vertical engine, the latter two, apparently, not being far apart. Exigencies favor the turbine, because of its smaller size and rectangular proportions, and it not infrequently happens that increased power may be supplied by locating the turbine in existing space, whereas an engine would necessitate building extension, and, perhaps, the purchase of additional land. An instance of this kind arose at Akron, O., where in the existing space no arrangement could be devised to accommodate additional engine power. It was found possible, however, by rearranging auxiliary apparatus, to provide space for one 750 k.w. and one 400 k.w. turbo-generator outfit, which will shortly be in operation.

Several actual cases were given to show the saving in cost. A plant was recently laid out to contain three 1,000 k.w. units, with vertical cross compound Corliss engines. Subsequently three more 1,000 k.w. units were contracted for, steam turbines being ordered. It was found that the turbine saved 900 square feet of engine room floor space and about 38,000 cubic feet. Had the whole plant been originally designed for turbines the saving of space would have been double these amounts, and the cost of land, building and foundations been reduced about $50,000.

An electric railroad plant in Ohio was some time ago installed, in which there are 500 k.w. generators, direct connected to cross compound Corliss engines. Space was provided for two more units of the same size. For the increased power two 1,000 k.w. turbine outfits were purchased, which will go in the space left, and leave room for another turbine of 2,000 k.w. Thus the engine room space planned for 2,000 k.w. is found sufficient for 5,000 k.w. It is estimated that the boiler plant extension will be reduced about one-third, because of improved efficiency. It is figured, too, that a saving of $2,900 was effected on each 1,000-k.w. foundation.

One other case, of perhaps greater interest, recently came to notice, that of a plant of 800 k.w. capacity, laid out on modern lines, employing vertical cross-compound condensing engines. There is no space for additional engine power, and any increase would require building extension and encroachment upon valuable land. It was shown that without going beyond the present building walls, and without disturbing the existing machinery, the plant might be doubled in capacity by installing turbines in the space available below the present engine room level, and adding another deck of boilers. And it has been figured that this arrangement would effect a reduction of over $3 per kilowatt per annum in the present interest charge.

As to the cost of the turbo-generator outfit itself, it is stated that its price is reasonable; that, indeed, where the comparison is fair, the turbine will require the lesser first investment. The larger field for the turbine begins about where the high speed engine leaves off. Its steam economy at once identifies it with the most efficient engine practice, and it therefore applies more appropriately to the classes of service where medium and large size units are used. The comparison, then, lies generally between the turbine and the slow speed engine. It remains merely to take an engine and generator of good construction, bring the engine efficiency as nearly as possible into parity with that of the turbine, also having it possess the same overload capacity, to find that the turbine is reasonable in price. And when we add the possible saving in foundations, buildings, etc., the first cost of installation is usually much in its favor.

The advantages of the turbine in parallel operation were brought out, and also in the use of superheated steam. The turbine may be used unreservedly with superheat of any feasible temperature. It has no internal rubbing surfaces, and there are no glands to become injured. Also, as no cylinder oil is required, there is no opportunity for lubricating trouble. Furthermore, there seems to be with the turbine rather more proportionate benefit from superheat than with the piston engine, because of diminished skin friction.

In closing the discussion on his paper, Mr. Sniffin said that the Hartford turbine plant has been running since the early days of its installation for some months whenever it was wanted. He added that the turbine sold as a 1,500 k.w. machine, and that it is in operation only some two or three days a week, being a relay to the water power. It carries, however, a load from 1,800 to 2,000 k.w., and, as a matter of fact, has carried, without any apparent difficulty, 2,800 k.w. There is a turbine at Wilmerding, of 400 k.w., which has run since the 1st of February, 10 hours a day, carrying its full load, generating current for factory power and for light. The Westinghouse Air Brake Company has four 400-k.w. machines that have been running for about three years, doing all the work of the factory. The economy is very high, and the repairs have been practically nothing. The Company is now building four 4,000 k.w. turbines, three of which are for the Rapid Transit Subway in

[1] *Electrical World and Engineer.*

New York, to be used for lighting the subway. Four 5,000 k.w. turbines are to be built for the Metropolitan District Road in London, and will operate the entire system, and three 3,500 k.w. machines are being built for the Metropolitan Railroad of London. The De Beers Company, of Kimberley, South Africa, has ordered two 1,000 k.w. turbines, which will both be shipped within the next 30 or 60 days. Prof. Thurston, acting as Engineer for the De Beers Company, will conduct a series of tests of these machines before they go. The Cleveland and Western Railway will put in two 1,000 k.w. machines for driving its new system, the turbines being now under construction.

Propositions of the Labor Question.

By Mr. Egbert P. Watson, in *Iron Age*.

A recent utterance from an authoritative source, the Secretary of the National Civic Federation, leads me to think that many persons have formed erroneous ideas of the scope and character of labor organizations as shown by them in everyday business experiences, and that they are, if not exactly blessings in disguise, associations which should be fostered and encouraged by all, to the end that the workman and the capitalist may lie down together in a business millennium. I can draw no other inference from the positive assertions made by the author of the article mentioned, because, while depicting the objects and aims of labor organizations—the "revised creed" is the title of the closing paragraph—the author speaks as if the revision was already in force and that a new commercial heaven and a new earth have been formed wherein there is to be, hereafter, no disagreement. For one I would be glad to do business under the new dispensation, but in order to feel secure in transactions, prior to assuming responsibilities, I, and others, too, I fancy, would like to know the probabilities of the new departure in labor organizations being faithfully observed under all circumstances. Mark Twain was requested to place a bet upon a certain race horse, but he declined upon the ground that he was a stranger in the land and did not know anyone to hold the stakes, whereupon the party of the first part pointed out his friend Jones and said he would act as stakeholder. Mr. Twain scrutinized Mr. Jones for a moment and then said: "Yes, but who will hold your friend Jones?" This is pertinent to trade union promises and resolutions; they are not new, and experience in the past leads those to whom they are tendered to regard them with apathy. At this writing one of the staples of life and trade, coal, is withheld from the people by the acts of trade unionists, who must have been in possession of the determination to turn over a new leaf some weeks ago, but possibly concluded that it did not refer to them, for this "revised creed" says, *verbatim:*

"1. Strikes are bad and should be a last resort.

"2. Scales of wages should be determined by mutual concessions in conference with employers, rather than by a demand submitted by the union as an ultimatum.

"3. When thus determined this scale becomes a contract, which is not only as sacred as any business contract, but the violation of which by the union is the most disastrous blow that can be struck at the principle of unionism.

"4. Sympathetic strikes are unwise because they violate contracts, bring injury to friendly employers and the friendly public, and arouse public opinion against the organization.

"5. It is not essential to a contract that non-union men should be excluded from employment along with union men, provided they receive the same pay.

"6. The union should attract the non-unionist by persuasion, not by force, into membership.

"7. Violence in conducting a strike alienates the public, brings the courts and the militia to the support of employers and reacts disastrously upon the union.

"8. Unionists should welcome new machinery.

"9. Unions should abandon arbitrary restrictions on output and direct their attention to hours of labor and rates of pay."

This is a tolerably long list of what men who are quarreling with their bread and butter should observe, but it must be said that if they did there would be an end of all the troubles that exist at present, and, likewise, an end to unions. Paragraphs 6 and 7, if put in force, would leave disorganized labor high and dry on shore, and they are sharp enough to see it.

Trades unions exist only by arbitrary acts and pronunciamentos, and there is no trust in existence which exercises such absolute control over its members as labor associations do. In the town where I live a union man is fined $25 if he merely works in the company of a non-member. If a man who does not belong to the association is employed in any capacity where society men are, the work stops until he is removed. A member of a certain trade which was on strike for higher wages found a job out of town, and applied to his association for a traveling card. It was given him and he went away and remained for 3 months. When he returned and applied for admission to the union again he was refused until he had paid the initiation fee over again, upon the pretext that he had left the town and was not a citizen of it! These acts are perpetrated without any hearing of the facts in the case, and the sufferer has no recourse whatever. Now, in the face of them, is it worth while to descant upon the great value to the workman of his union? Is it of any service to business, or any security to their interests, to publish an essay upon what trades unionists have learned in the past, when a strike accompanied by violence, intimidation and actual manslaughter exists at this hour? I should say not; and not until the law enforces the privilege of an American citizen to sell his labor at his own price will overt acts cease. It will take some time to assure workingmen that they are secure, for turbulence extending over a generation cannot be suppressed in a few weeks. When all men are free again that day will see the end of trades unions as they now are, for there will be no reason for their existence.

Correspondence

[The Journal is not responsible for the opinions expressed by correspondents.]

A Letter from Mr. Egner.

New York, Oct. 18, 1902.

To the Editors American Gas Light Journal: At the recent meeting of the American Gas Light Association a paper was read by Mr. R. B. Brown, of Milwaukee, on "Why Milwaukee did not Build Inclines," and in connection with that subject I beg space in your columns for a statement which the writer was unprepared to make on the floor of the convention hall.

On the 6th inst. I called at the office of the Secretary of the American Gas Light Association and paid my dues for the ensuing year. Upon that occasion Mr. Forstall remarked to me, while conversing about the papers to be read at the then coming meeting, that he regretted *not to have called for a paper on inclined retorts*, and he did not see how he overlooked it. That is what I understood him to say. Consequently, hoping to bring the question of inclined retorts before the Association, because I deemed it an important one, I framed a question for the "Question Box," mailing it by special delivery to Secretary Forstall on the early morning of the 13th inst. I was, therefore, much surprised when, on the morning of the opening of the meeting, I saw printed on the programme the announcement of the paper by Mr. Brown, and was still more surprised when, in the course of discussion of said paper, Secretary Forstall stated that he had been for six months trying to get Mr. Brown to write a paper on that subject.

Mr. Brown's paper being so radically different from all previous papers concerning inclined retorts, it seemed to me and to many other members of the Association that it should not have been introduced in, what must seem to many as it did to me, such an unfair manner, giving no one any opportunity to prepare, according to the well established custom of the Association, a suitable reply. Mr. Brown started in with a statement as follows:

"The question of inclines vs. horizontals has been discussed with so much acerbity, and so little data and actual results have been brought out, so many glaring misstatements have been made and apparently accepted on the floors of our Gas Associations, that it does seem to be time that we got down to cold matters of fact, divest the inclines of all their glamor, their undoubted theoretical beauty, and consider them from a more practical standpoint."

I feel warranted in saying that this statement of Mr. Brown is untrue in detail and unfounded in fact, and on the whole is an indefensible reflection upon the integrity of previous writers on the subject. However, I speak only for myself in this letter. While every man has a right to his own opinions and should have a fair opportunity to express them, I think he has no right to attack others without a shadow of proof, which I challenge Mr. Brown to produce in this instance.

As to his figures, they are so obviously incorrect in many important particulars, that they do not seem to merit a reply; but I shall give them my attention at the earliest opportunity, and shall prove some of them at least as untrustworthy and absolutely wrong, as his attack on the veracity of early writers on the subject of the inclined retorts was unwarranted. Very respectfully, Frederic Egner.

SPECIAL ENGLISH CORRESPONDENCE.

COMMUNICATED BY NORTON H. HUMPHRYS.

SALISBURY, ENGLAND, Oct. 10th, 1902.

Testing Coals.—A Minimum Charge and a "Free" Installation.—The Gas Cooking Stove.

The accurate valuation of gas coals is a subject that admits of many differences of opinion, and when the practical working results do not come up to the expected standard, it is not an easy thing to locate the cause of the deficiency. There may be some unexpected defect in the apparatus or in the methods of working; or these may be normal in every respect, and the quality of the material supplied may be the cause of the difficulty. It is, therefore, important that the gas engineer, when working on a fairly large scale and carbonizing perhaps some hundreds of tons of coal per day, should have a reliable means of valuing the quality of the material supplied, independently of the practical indications afforded by his station meter and works' photometer. It is, therefore, usual when circumstances admit to provide a coal testing apparatus as a part of the laboratory furniture. Unfortunately the cost of a complete set and the fact that a special room or building is necessary for its accommodation, is such that unless the undertaking is fairly large it is out of the question. And there is no advantage in putting down a testing plant unless proper arrangements are made for working it. The manager of a 10 or 20-million works, having all the details of the business on his hands, cannot spare the necessary time for systematically following up this important detail. The first cost of the apparatus, together with that of following up its use with regularity, has led to a general neglect for which the industry at large has to suffer. Various suggestions have been put forward from time to time in the direction of some combined action. Some few years ago Mr. J. W. Helps, of Croydon, proposed an experimental works under the auspices of one of the Gas Managers' Associations, but nothing has ever been done. It is a somewhat larger matter than can be worked with the funds available from members' subscriptions only, and could not be carried out without the aid of more substantial contributions from the hands of gas undertakings. The deficiency has been met to some extent by the personal labors of Mr. Newbigging and others, who have from time to time published the results of laboratory tests of various qualities or brands of gas coals, which will be found in "Newbigging's Handbook," "King's Treatise" and other standard works. Many of our larger gas undertakings have for their own guidance collected a quantity of such information; but the subject has never been followed out so completely or thoroughly as its importance deserves.

These remarks are suggested by the perusal of a paper on "The Analytical Valuation of Gas Coals," which was read by Mr. G. T. Lishman at the recent meeting of the Institution of Mining Engineers, and which includes a description of a set of apparatus as used by the author and considered by him to be well adapted for this purpose. The apparatus as described is similar to that with which readers of gas literature will be already well acquainted. There is a cast iron retort heated by a row of Bunsen burners, into which the experimental charge is introduced. The quantity taken is the stereotyped $\frac{1}{112}$ of a ton, or 2.24 pounds avoirdupois, and is contained in a sheet iron scoop or box 14 inches long, 4½ wide and 2 deep. There are two sets of U-tube condensers, surrounded by water jackets so as to admit of the temperature b ing regulated, a small scrubber packed with glass marbles, two purifying vessels and two 15-foot gasholders. The advantage of providing two gasholders is that two or more tests can be taken consecutively. The author advocates working at a regular temperature, and while this is desirable for comparative purposes, it does not touch the question of the best temperature for each class of coal. The gas engineer applies his skill to the object of getting either the best possible sperm value out of his material, or else to the getting of the greatest possible quantity of gas of a fixed value. In practice the last named condition prevails. The quality of the gas to be supplied is fixed and the object is to make 16, 18 or 20-candle gas preferably without the use of enriching materials. It is one thing to get the full value out of the coal and another to keep to a fixed quality. The introduction of a water gas and of cheap enriching materials has in some cases rather changed the complexion of the problem. If water gas of 20 to 25-candle quality can be made with advantage up to a certain proportion of the whole output, or if oil or other enriching material is cheap, the object may be to obtain a large yield of possibly inferior gas. This is a phase of the question that cannot be touched by the laboratory testing apparatus, and it is well to understand that the $\frac{1}{112}$ of a ton test does not afford more than a general indication respecting it.

While practical methods have been improved, to the great advantage of gas shareholders and gas consumers, the laboratory method remains unaltered, and the apparatus described by Mr. Lishman is practically the same as that which has been used in gas works laboratories for the last 50 years. The result is that the experimental test must look to its laurels. There was a time where it was considered good working to get even within 20 per cent. of the laboratory results. But regenerator furnaces have changed all that. As regards quantity of gas, the large scale working now closely approaches that of the $\frac{1}{112}$ ton list. There is still a marked difference as regards illuminating value, which gas engineers have been accustomed to ascribe to defects in their condensing apparatus. Mr. Lishman, however, offers another explanation and one that, if proved correct, is more satisfactory. He suggests that the gas made on the small scale is less permanent, by reason of its retaining hydrocarbon vapors that would be pumped out in the ordinary washers and scrubbers. Gas engineers have long entertained a suspicion that the usual condensing and scrubbing process involved some loss of illuminating value, and it is comforting to know that this impoverishment is unavoidable if a practically permanent gas is to be produced. The presence of light oily matters, which is always observable in the washer liquids or the drainings from the purifier boxes, affords some support to this view of the case.

I notice amongst the interesting items discussed at the meeting of the Pacific Coast Association, that the question of a minimum charge received some attention. The presumption is that if a party has gas laid on he intends to use it, and it would be very difficult to justify the conclusion that he is justified in putting the gas company to the expense and responsibility of keeping a supply of gas always in readiness, while he on his part need not use it once a year, or at any time unless he chooses. Even if he pays for the rent of a meter, there are other expenses that are not so covered. In England the only protection that gas suppliers have is that they can call upon the user to take gas to the value of 20 per cent. on the cost of the service, but I never heard of the clause being put into force, in regard to a consumer who from any cause ceases to use gas. No doubt every gas company has a few bad eggs, but the difficulty is not very pressing or sufficiently prominent to call for action. But the electric companies, wiser perhaps in their generation, invariably provide a minimum charge clause, usually for 20 units per quarter. A new aspect is put on the minimum charge question by an action before one of the lower courts in London, wherein the South London Electric Supply Corporation sued a customer for £1 3s. for current supplied and rent of meter. The plaintiffs put in an agreement under which the defendant bound himself to take electricity for three years and to pay for the installation at the rate of 10s. per quarter. The defense was that no electricity had been used. Although 12 lamps were put in the light was so bad that they had to be supplemented with candles. On applying at the offices he was advised to put in 20 to 30 lights, but this was out of the question, as the cost was already three times as much as gas. He therefore told the corporation that the light was bad and expensive, he should not use it, and they had better take away the meter and fittings. He tried new lamps every fortnight. Evidence was given in proof of the poor quality of the light. The judge said that the agreement did not permit the supply of anything in the way of light. The manager of the corporation claimed that it was merely a question of extra expense, and that they could be summoned if the quality of the supply was at fault. The judge asked if the corporation would let the defendant off the agreement, and was met by a decided refusal. He then said that the agreement specified that it should be operative under any circumstances for three years. These so called "free" installations were really very expensive ones. They were attractive to look at, but were binding for three years, and he wished the public would be more cautious in regard to signing such documents. They were different to the agreement with a gas company, who did not charge for more than was actually used, and he was reluctantly compelled to give judgment for the plaintiffs but would make no order as to costs as he considered the agreement one-sided. The moral was that people should not sign such agreements.

There is a difference in this case, as compared with one in which the user does not intend to take a supply regularly. The defendant would apparently have been a constant user, if the supply had answered his requirements. Obviously he would not take the responsibility of proceeding against the corporation in respect to defective supply, and it appears that such an agreement should include a clause specifying that the light should be efficient and satisfactory. Possibly the mistake was in only having 12 lights when 24 or 30 were really required. But on that point he could not be expected to make a decision, as he would rely on the advice of the officials who put down the installation. There is

nothing in this case that would justify a man from putting the suppliers to the expense and responsibility to laying on a supply to be held in readiness as a "stand by," and if it is found that people who really intend to do their lighting by means of electricity desire to keep a gas supply as a sort of second string, it is only fair that the gas company should receive a reasonable remuneration for such service outside of and in addition to the actual quantity used.

The increased consumption of gas that may be obtained by the use of cooking and heating stoves was the subject of a paper read by Mr. D. Garlick, of Barnoldsville, at a meeting of the North of England Gas Managers Association, which was held a few days ago. The title was well chosen, as the statistics quoted by the author go to show that not only has a great deal been accomplished in this direction, but also that there is plenty of room for more to be done. Mr. Garlick shows that a great deal has been done during the last 3 years. In 1898 the "Gas World Directory" commenced to give returns as to the number of gas cookers in use. The totals for 1898, from 688 undertakings, were over 2 million consumers and 509,000 cookers on an average of one to four. But this showing was largely affected by the London Gas Companies, who average one cooker to two consumers. Taking out the metropolis, the totals are just over 1½ million consumers and about 240,000 cookers or only one to 6¼. In 1901 the returns included 966 undertakings, from which it may be inferred that those for 1898 were somewhat incomplete. These represented over 3 million consumers and 928,000 cookers. The London Companies are still well to the fore with 375,000 cookers distributed over 713,000 consumers. And after deducting these the average is about one cooker to four consumers. One thing to be remarked about these returns is that in many cases the number stated is simply the stoves out on hire, and does not include those which are the property of the customer. Many persons, especially those concerned in the trade, prefer to have their own stoves, and there is no reason why they should notify the gas company of the fact that they are using a stove. But even after allowing for this it is evident that if the ratio in the metropolis is 1:1.9, it should not be so great as 1:4 throughout the country. Probably the small undertakings, selling gas at a high price, go to reduce the proportion, for many of our large and even moderate sized towns are not below London. But the point is this: If the gas cooker is such a convenience that it gains the favor of 50 per cent. of the customers, why is it not also adopted by a large proportion of the other 50 per cent. No doubt the introduction of the slot system is partly responsible for the largely increased output of stoves, but this is by no means the only factor concerned. I have complained lately about the high prices of coal in 1900 and 1901, but they were a capital advertisement for the gas stove, if a very costly one. With coal advanced 50 per cent. and gas not more than 10 per cent., the consumer naturally looked towards gas, and lent a willing ear to the advances of the gas company. Mr. Garlick's own experiences are interesting. In 1895 he had 320 consumers and 85 cookers, and in 1902, 1,250 consumers and 600 cookers, and the cooking consumption was over one-fourth of the whole. In reviewing the methods to be adopted he advocated exhibitions and cookery demonstrations, systematic advertising, a good show room, canvassing, and fixing free, or at least on easy terms. Mr. Garlick concluded with a word in favor of the gas engine, and if he could have illustrated this phase of the subject by some particulars as to the ratio of gas engines to gas consumers, he would probably have brought out some facts worthy of careful consideration. We complain about the ratio of cookers to consumers being as high as 1:4, but with regard to gas engines, the proportion would be more like 1:40. The efficiency of the engine has been nearly doubled and its price brought down more than half, but there has not been a corresponding increase in the output and adoption of these appliances. As regards stoves my own experience fairly accord with those of Mr. Garlick. With gas at a moderate price as compared with that of coal, with reasonable attention to the wants and the whims of the consumers, and a thoroughly efficient service there is no difficulty in bringing down the ratio of stoves to consumers to less than 1:2, and the matter need not stop here. And this matter should not be passed over without a word of recognition as to the enterprise and ability exhibited by the makers of gas stoves in meeting the demand for a cheap and at the same time efficient family cooker. It is no use to put out a pretty toy, because if its appearance induces people to take it they will not use it regularly. There must be an oven not less than 14 inches wide, 12 deep and 24 high, a griller that will make good toast and turn out chops or steaks well browned, and two good boiling burners besides. With these conveniences there need be no polished or fancy scroll work. The design need not be ugly because it is plain, but the castings should be good quality, strong, and capable of resisting all ordinary wear and tear.

ITEMS OF INTEREST FROM VARIOUS LOCALITIES.

MR. C. W. WESTON, Assistant Superintendent of the Fulton County Gas and Electric Company, of Johnstown, N. Y., has been appointed Superintendent of the Carbondale (Pa.) Gas Company, vice Mr. B. C. Guerin, resigned. Mr. Weston will assume charge at Carbondale the 1st prox.

MR. W. C. GERST, who has been Secretary of the Altoona (Pa.) Gas Company since 1893, has been appointed Treasurer of the Altoona Edison Electric Illuminating Company.

THE proprietors of the Fond du lac (Wis.) Street Railway and Light Company have agreed upon a plan for doubling the capacity of the gas works division of their enterprise. The estimated cost of the betterments is put at $25,000.

THE Reinhart Superheating Gas Burner Company has been formed by Messrs. C. V. Childs, H. N. Smith and S. Bloomfield. The concern is intended to exploit certain patents in connection with hydrocarbon burners and gas generating apparatus. The capitalization is fixed at $125,000. The local office is in the headquarters of the New Jersey Registration and Trust Company, of East Orange, N. J.

A CORRESPONDENT in Riverside, Cal., forwards the following: "The local Gas Company has taken a new departure in the employment of a woman gas inspector. She will call at each residence and instruct the housewife in the manifold uses of gas for cooking and heating. She will be armed with a wrench and a screwdriver, and will inspect the gas cooker and see that it is working properly. It will be her duty also to make suggestions, where such are desired, as to the best method of cooking various foods. She will receive and report all complaints to the office, and see that they are attended to. From 4 to 6 o'clock each afternoon, and from 7 to 9 o'clock on Saturday evenings, she will be at the office in the Covert Block, to meet anyone and everyone interested in the use of gas."

MR. F. R. ANSTEY is informed that Mr. A. H. Branch, formerly Manager of the old Denver (Col.) Gas Company, is located in Oklahoma City, Okla., where he is the President and Manager of the Oklahoma Gas and Electric Company.

MR. M. E. BRACKETT and his associates in the proposed construction of the plant for the Petoskey, Bay View and Northern Gas Company, of Petoskey, Mich., have purchased a site on an ample plot (3,000 square feet) just north of the Pere Marquette Railroad and east of Wachtel avenue. They declare that the Company will be ready to supply gas on or before July 1, 1903.

MR. FRED. W. WENBAN has resigned the position of Superintendent to the Newark (N.Y.) Gas Light and Fuel Company, to accept a responsible office with the Madison County Gas and Electric Company, of Oneida, N. Y.

AT the annual meeting of the Troy (N. Y.) Gas Company the following Directors were elected: A. Bleecker Banks, A. E. Bonesteel, A. N. Brady, Thomas Breslin, Fred. E. Draper, James Fleming, S. O. Gleason, George P. Ide, Wm. Kemp, F. J. Molloy, E. Murphy, Jr., R. C. Pruyn and W. A. Thompson.

AN order confirming the report of John H. Ward, as Special Receiver in the case of the Rochester Trust and Safe Deposit Company against the Le Roy (N. Y.) Gas and Electric Company, has been granted by Justice Dunwell in Rochester at Special Term.

A CORRESPONDENT incloses the following, under date of the 18th inst., from South Amboy, N. J.: "Mr. Alfred R. Clark, Superintendent of the Standard Gas Company of this place, died quite suddenly the evening of the 17th inst. Deceased, who was born in Poughkeepsie, N. Y., August 1, 1855, was an expert gas engineer, having held responsible positions in large gas plants throughout the country. He also for a time followed the business of contractor in laying gas, water and sewer mains. He made this borough his home for about 8 years. When the proprietors of the Standard Gas Company took charge of the gas plant here he was appointed Superintendent. The plant was all run down, in fact, it was in wretched condition, and the people had lost all confidence in its capacity for any kind of service. Great odds were against him, but he took active measures to overhaul the plant, and improved it to the point that its service was satisfactory to the residents. During his administration the output of the Company was more than doubled. He is survived by his wife, a son and three daughters."

GOVERNOR MCLEAN, of Connecticut, has appointed Mr. William G. Mixter, of New Haven, to be Inspector General of gas meters and illuminating gas for a term of 3 years. The appointment is made under section 3,994 of the revised statutes of 1888, and 4,510 of the revision of 1902. The section reads: "The Governor shall appoint an Inspector General of gas meters and illuminating gas, who shall be a resident of Hartford or New Haven, and shall hold office for 3 years." The sections are as follows:

"Sec. 4,571.—Said Inspector-General shall appoint a deputy in every town and city where gas works are established, when requested by the Mayor of such city, the Selectmen of such town or the Warden of any borough therein. The Inspector-General or any of his deputies shall inspect and prove the accuracy of every gas meter in his town furnished to any person by a manufacturer of gas at the request of any consumer or such manufacturer. Such inspection shall be made for a temperature of 60° F., and at the average pressure at which gas is supplied in such town, and he shall stamp or mark every such meter found not to vary more than 2 per cent. from the standard, with some suitable device, and his name, and the date of its inspection.

"Sec. 4,572.—One dollar for each meter so inspected, with the cost of moving and replacing it, not exceeding 50 cents, shall be paid to the officer inspecting it, if it be found correct, by the consumer, if he requested such inspection, otherwise by the party furnishing the gas.

"Sec. 4,573.—The Inspector-General and his deputy shall inspect monthly the quality and purity of illuminating gas furnished in his town or any city or borough therein, if requested, by the Mayor of the city, Warden of the borough or Selectmen of the town, and to report to them the result of such inspection, for which he shall be paid $5 by the town, city or borough requesting it. When any gas so furnished shall be found upon such inspection to be below the standard value, on the average for the quarter, the person furnishing it shall make a deduction in favor of the consumer from the price charged for gas at a legal standard, proportioned to the inferiority of the gas as reported by the inspector."

It is understood that the appointment is made as a consequence of the the agitation conducted by the Hartford Landlords' Association and different persons in this city. The Court of Common Council passed a resolution requesting the Mayor to ask for the appointment of an Inspector, but the resolution was not signed by Mayor Sullivan. The Inspector-General is a graduate of Yale in the class of 1867, and is a professor of chemistry in the college. He formerly held the office, and on the expiration of his term, in 1898, declined a reappointment.

THE Toledo (O.) Gas Radiator Company has been incorporated by Messrs. A. R. Gordon, J. T. Bradford, R. W. Lambert and others. It is capitalized in the sum of $6,000.

ASSISTANT CORPORATION ATTORNEY MCDERMOTT, in response to the request of the St. Paul (Minn.) City Council for an opinion as to whether the authorities can compel the St. Paul Gas Company to extend its mains whenever the residents of any particular locality ask for such extension, declares that the Council, under the charter of the Company, may not exercise such power.

MESSRS. CHARLES F. COFFIN, Edwin C. Angle and James A. Van Vorst, Directors of the Mohawk Gas Company, of Schenectady, N. Y., have certified to the Secretary of State that the Company has extended its purposes to include the manufacture of electricity for light, heat and power uses; also, the manufacture of gas ranges, fixtures, electroliers and other supplies used in connection with the distribution of gas and electricity.

SENATOR JESSE JEWELL declares that at the next session of the Missouri Legislature he will ask for the passage of a bill prohibiting gas companies from requiring a deposit from intending consumers.

MESSRS. EDWARD H. WERT, Herbert F. Harris and C. R. Fritcher, of Harrisburg, Pa., have chartered the Blair County Gas Company, which proposes to supply gas for illuminating purposes only to the residents of Altoona, Hollidaysburg, Janista, Milldale, Logan, Curtis, Allegheny, Blair and Frankston townships, Blair County, Pa.

WE regret to report the death, at Nashua, N. H., the evening of the 10th inst., at his home in that city, of Mr. William Diah Cadwell, Agent of the Nashua Manufacturing Company. Deceased, who was in his 68th year, having been born in Montpelier, Vt., October 16, 1834, was an authority on the manufacture and printing of cotton fabrics, and was rightfully esteemed in the commercial, political, religious and Masonic circles of New Hampshire. He was Treasurer of the Nashua Gas Light Company for 24 years, resigning the position when that plant was merged with the local electric lighting interests under the title of the Nashua Light, Heat and Power Company. He is survived by his wife, a daughter and a son.

SO GREAT has been the damage occasioned to the electric light globes, by the slungshot marksmanship of the street gamins of Rochester, N. Y., that the Commissioner of Public Works has been compelled to offer a reward for information leading to the arrest and conviction of the offenders.

ADVICES from Marblehead, Mass., are to the effect that the proprietors of the Lynn (Mass.) Gas and Electric Company have secured control of the plants and franchises of the Marblehead Gas and Electric Light Oompany.

THE new owners of the Bellingham Bay Gas Company, of Fairhaven, Wash., have changed the corporate title of the concern to that of the Whatcom-Fairhaven Gas Company. The owners propose to expend $100,000 in plant betterment.

THE Cambridge (Mass.) Gas Light Company has ordered an increase of the wages of its employees, which virtually amounts all round to an addition of 10 per cent.

THE gas and electric lighting properties of Bath, N. Y., which have for some time been operated under the name of the Bath Electric Light, Heat and Power Company, have been purchased by a Philadelphia syndicate. The Directors in the new interest are Messrs. C. P. King, J. W. Pittock and R. W. King of Philadelphia, and J. T. Parkhurst and Wm. H. Hallock, of Bath.

THE annual report of the Edison Electric Illuminating Company, of Boston, for the year ending June 30, 1902, compares as follows with that of 1901:

	1902.	1901.	Increase.
Gross	$2,460,158	$2,367,359	$92,790
Expenses	1,510,427	1,449,629	60,798
Net	$349,731	$917,730	$32,001
Other inc	25,981	13,948	12,033
Total inc	$975,712	$931,678	$44,034
Int. and divs	859,614	879,285	*19,671
Surplus	$116,098	$52,393	$63,705

*Decrease.

During the year the purchase of the Boston Electric Light Company was completed. The affairs of the Boston Company came under the management of this Company early in October of last year. The acquisition of the Suburban Light and Power Company was also decided upon during the year, and all the property and assets of that Company were purchased for cash, and its affairs turned over to this Company in September of last year.

SOME days ago the Hartford (Conn.) Board of Aldermen were called on to consider a resolution passed by the City Council, which authorized the Mayor, the City Attorney, 2 Aldermen and 4 Councilmen to act as a committee to investigate the proposition whether or not it would be a good thing to have "municipal gas." The Aldermen in debating the resolution concluded that it was altogether too indefinite, in that it failed to show whether the question of the municipal ownership of a gas plant was intended. The resolution was "indefinitely tabled."

MR. G. FALKENSTEIN, of Cooperstown, N. Y., has been appointed Superintendent of the Capital City Gas Company, Montpelier, Vt.

THE Board of Directors of the American Light and Traction Company have declared a dividend of 1½ per cent. for the quarter ended September 30th. It is payable the 1st prox.

THE authorities of Ocean City, N. J., are still haggling over the terms of the franchise which has been petitioned for by the promoters of the City Gas Light Company.

Electricity says that the commission which has charge of the proposition for the establishment of a State electrical laboratory at Schenectady, N. Y., look with favor upon the plan, and it is probable that a recommendation to this effect will be made to the Legislature. This commission, as we stated some time ago in these columns, is composed of State Engineer Bond, A. C. Buck, of Niagara Falls, and C. P. Steinmetz, of Schenectady. It was appointed by last year's Legislature and has since been examining into the advisability of having such a bureau. It is thought that the present commission will advise the appointment of a permanent commission to act as a board of governors of the new laboratory. This body will be made up of President Raymond, of Union University, State Engineer Bond, two civil engineers to be selected by the American Society of Civil Engineers, the director of the laboratory, the president of the board of governors of Union University, and one other college authority. While the laboratory will be a State institute, and bear no relation to Union University, still, in consideration of the benefits which would accrue to Union from the establishment in the college town of the State laboratory, the university will annually admit 25 beneficiary students to its courses. It is expected that the commission will soon have ready definite plans for the laboratory. The plant will probably consist of 4 buildings and equipments.

THE AMERICAN GAS LIGHT JOURNAL

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PROPRIETORS.

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Notification Respecting Advertising.—Orders for new advertising, or for changes in standing advertisements, to insure attention in the issue following their reception, must be in hand any time of Wednesday.

AGENTS:

New York—American News Co. 39 and 41 Chambers St.
Germany—Lemcke & Buechner, of New York.
England—Aug. Siegle, 30 Lime Street, London.

MONDAY, SEPTEMBER 27, 1902.

The Market for Gas Securities.

Profit taking and the disturbed condition of the money market are the factors that made for lower prices generally on the Exchange late this week. Consolidated closed to-day (Friday) at 218½ to 220, and it looks a certainty that it will sell for 230 or more before December 1st. The unprecedented demand for gas continues, the atmospheric conditions being especially favorable for the companies.

Brooklyn Union is at 228 to 235, as against 233 to 238 a week ago. If surface indications go for pointing the way, by the time Consolidated crosses 230, Brooklyn Union should be hugging the 250 mark. Peoples, of Chicago, is a trifle lower, and the same remark applies to both classes of Lacledes. Washington (D.C.) gas is again showing signs of activity, the quoted prices being 375 to 380. The gas bond market is brisk, and the trading is being done at advancing figures.

Gas Stocks.

Quotations by George W. Close, Broker and Dealer in Gas Stocks.

16 WALL STREET, NEW YORK CITY.

OCTOBER 27.

☞ All communications will receive particular attention.
☞ The following quotations are based on the par value of $100 per share.

N. Y. City Companies.	*Capital.*	*Par.*	*Bid.*	*Asked.*
Consolidated	$73,177,000	100	218¼	220
Central Union, Bonds, 5's.	3,000,000	1,000	110	112
Equitable Bonds, 6's	1,000,000	1,000	105	..
" 1st Con. 5's	2,300,000	1,000	118	120
Metropolitan Bonds	658,000	..	108	112
Mutual	3,500,000	100	350	..
Municipal Bonds	750,000	..	..	..
New Amsterdam Gas Co. .. Bonds, 5's	11,000,000	1,000	112½	113
Northern Union, Bonds, 5's.	1,250,000	1,000	108	110
New York and East River. Bonds 1st 5's	3,500,000	1,000	112	113
" 1st Con. 5's	1,500,000	..	109	111
Richmond Co., S. I.	348,650	50	100	..
" Bonds	100,000	1,000	103	..
Standard	5,000,000	100	130	140
Preferred	5,000,000	100	150	160
Bonds, 1st Mortgage, 5's	1,500,000	1,000	115½	118
Yonkers	299,650	500	130	..
Out-of-Town Companies.				
Brooklyn Union	15,000,000	100	228	235
" " Bonds (5's)	15 000,000	1,000	119	119½
Bay State	50,000,000	50	1¼	1⅜
" Income Bonds	2,000,000	1,000	.	75
Binghamton Gas Works	450,000	100	28	30
" 1st Mtg. 5's	509,000	1,000	93	96
Boston United Gas Co.— 1st Series S. F. Trust	7,000,000	1,000	82	85
2d " " "	3,000,000	1,000	47½	50
Buffalo City Gas Co.	5,500,000	100	10½	11
" " Bonds, 5's	5,256,000	1,000	79	81
Capital, Sacramento	500,000	50	..	35
Bonds (6's)	150,000	1,000		
Central San Francisco	000,000	..	106	108
Chicago Gas Co. Guaranteed Gold Bonds	7,650,000	1,000	104	104¼
Cincinnati Gas & Elec. Co.	29,500,000	100	100½	100¾
Columbus (O.) Gas Co., 1st Mortgage Bonds	1,500,000	1,000	101	101½
Columbus (O.) Gas Lt. & Heating Co	1,682,750	100	88¼	89¼
Preferred	3,026,500	100	107½	109
Consumers, Jersey City Bonds	600,000	1,000	102	103
Consumers, Toronto	1,700,000	50	218	225
Consolidated, Baltimore	11,000,000	100	73¼	73½
Mortgage, 6's	3,600,000	..	..	115
Chesapeake, 1st 6's	1,000,000	..	..	..
Equitable, 1st 6's	910,000	..	..	..
Consolidated, 1st 5's	1,490 000	..	.	112
Consolidated Gas Co. of N.J.	1,000,000	100	15	17
" Con. Mtg. 5's	380,000	1,000	85	87
Consolidated G. & E. Co.'s. Little Falls, N.Y.	90,000	100	..	100
Bonds	75,000	..	..	100
Detroit City Gas Co	4,825,500	50	.	89
" Prior Lien 5's	5,603,000	1,000	99½	100
Detroit Gas Co., 5's	381,000	1,000	77	79
" Inc. 5's	16,000	100	94	94½
Equitable Gas & Fuel Co., Chicago, Bonds	2,000,000	1,000	..	101
Essex and Hudson Gas Co.	6,500,000	..	34	38
Fort Wayne	2,000,000	..	.	.
" Bonds	2,000,000	..	55	..
Grand Rapids Gas Lt. Co. 1st Mtg. 5's	1,225,000	1,000	104½	105
Hartford	750,000	25	245	265
Hudson County Gas Co., of New Jersey	10,500,000	..	25	..
" Bonds, 5's	10,500,000	..	101	103
Indianapolis	2,000,000	..	70	80
" Bonds, 6's	2 650,000	..	103¾	104½
Jackson Gas Co	250,000	50	73	75
" 1st Mtg. 5's	250,000	1,000	101	102½
Kansas City Gas Light Co., of Missouri	5,000,000	100	..	36
Bonds, 1st 5's	3,822,000	1,000	102	104
Laclede, St. Louis	10,000,000	100	84	86
Preferred	2,500,000	100	100	110
Bonds	10,000,000	1,000	109½	110
Lafayette Gas Co., Ind.	1,000,000	100	..	60
Bonds	1,000,000	1,000	60	65
Louisville	2,570,000	50	112	120
Madison Gas & Elec. Co. " 1st Mtg. 6's	350,000	1,000	107½	109½
" 6 per cent. scrip, due 1910	100,000	25	25	87
Montreal, Canada	2,000,000	100	218	184¾
Newark, N. J., Con. Gas Co	6,000,000	..	56	58
Bonds, 6's	4,600,000	..	105	106¾
New Haven	1,000,000	25	300	325
Nashville Gas Lt. Co.	1,000,000	100	110	..
Oakland, Cal.	2,000,000	..	46	47
" Bonds	750,000	..	..	..
Peoples G. L. & Coke Co., of Chicago	25,000,000	100	103¾	103½
Peoples Gas Lt. & Coke Co., Chicago, 1st Mortgage	30,100,000	1,000	..	..
2d "	2,500,000	1,000	104	
Rochester Gas & Elec. Co..	2,150,000	50	88	.
Preferred	2,150,000	50	118	..
Consolidated 5's	2,000,000	..	87½	90
San Francisco, Cal.	10,000,000	100	43	45½
St. Paul Gas Light Co.	1,500,000	100	45	47
1st Mortgage 6's	650,000	1,000	113	116
Extension, 6's	600,000	1,000	113½	115
General Mortgage, 5's	2,465,000	1,000	92	93
St. Joseph Gas Co. " 1st Mtg. 5's	751,000	1,000	95	96½
Syracuse, N. Y.	1,975,000	100	29	..
Bonds	2,047 000	1,000	99½	100
Washington, D. C	2,600,000	20	375	380
First mortgage 6's	600,000	..	..	..
Western, Milwaukee. Bonds, 5's	4,000,000	..	109½	110
Wilmington, Del.	600,000	50	230	..

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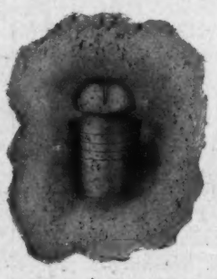

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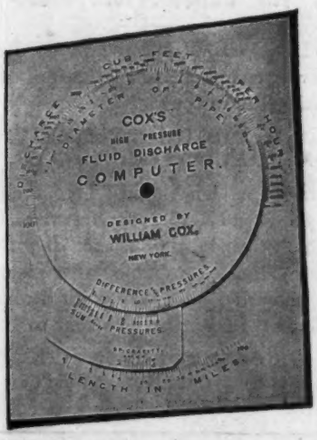

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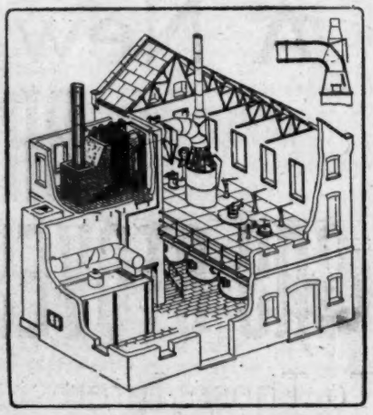

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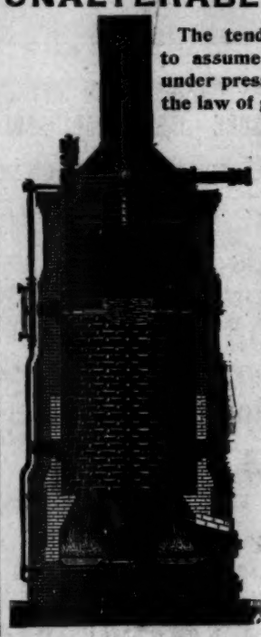

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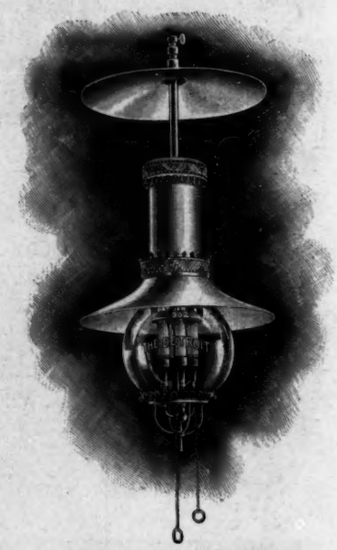

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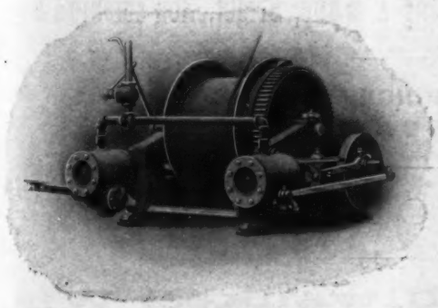

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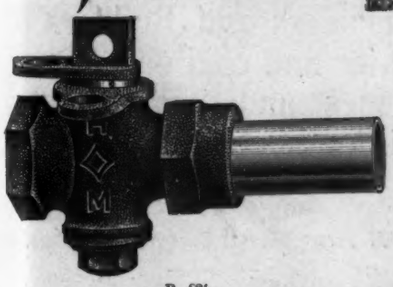

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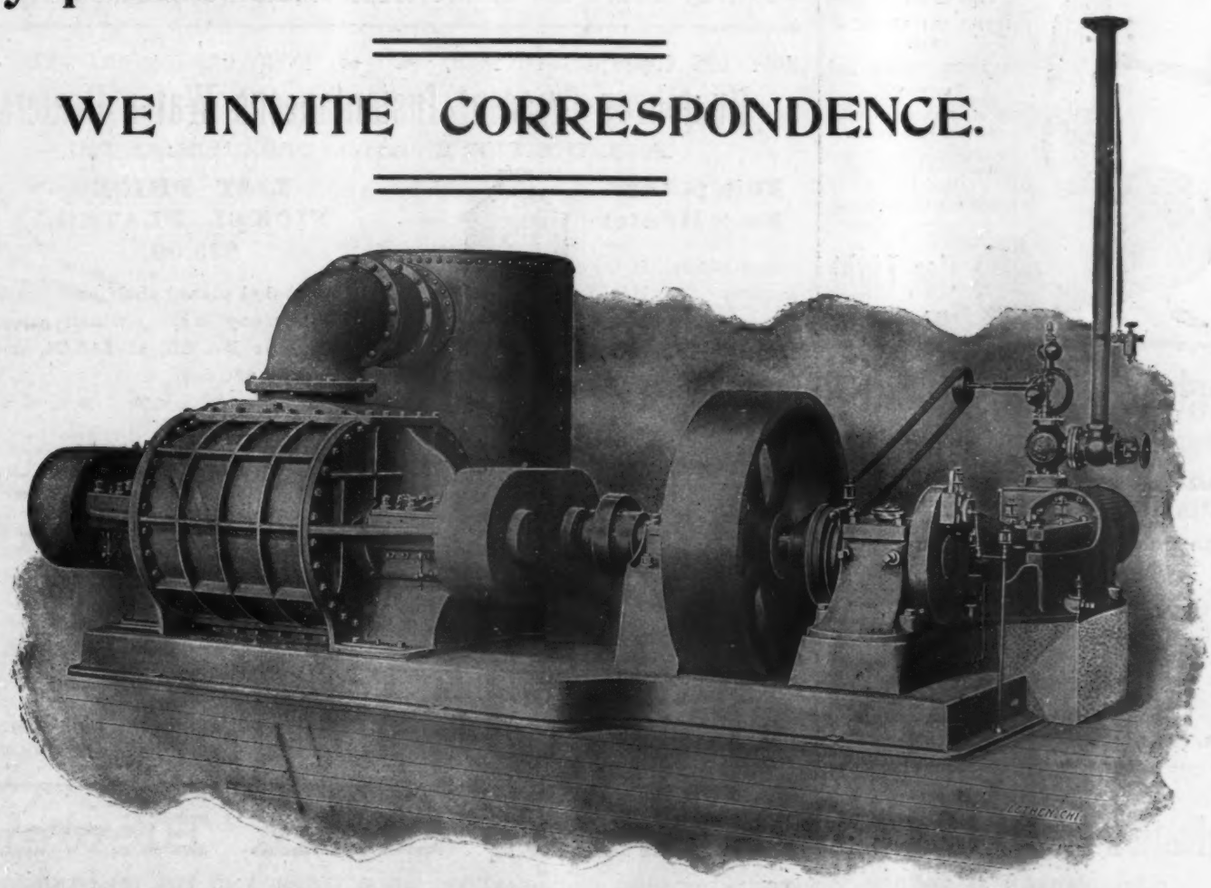

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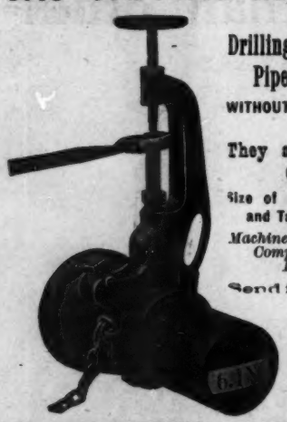

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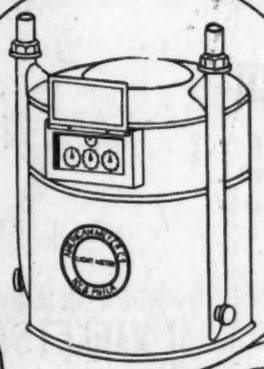
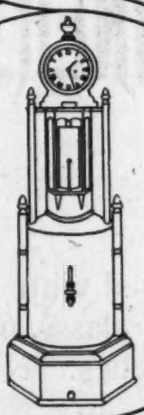




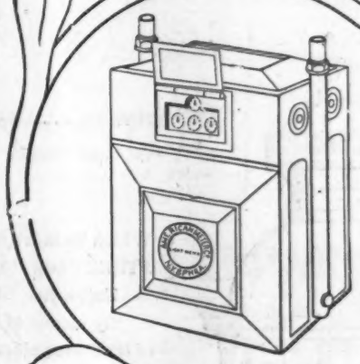
PUBLIC LIGHTING TABLE.

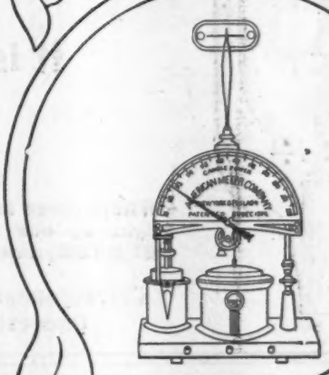
NOVEMBER, 1902.

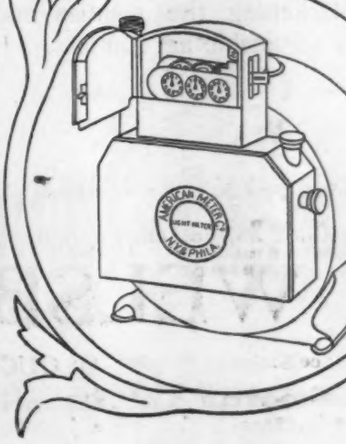
Day of Week.	Table No. 1. Following the Moon.			Table No. 2. New York City. All Night Lighting.	
	Date.	Light.	Extinguish.	Light.	Extinguish.
				P.M.	A.M.
Sat.	1	5.30 PM	5.30 AM	4.45	5.35
Sun.	2	5.30	5.30	4.45	5.35
Mon.	3	5.30	5.30	4.45	5.35
Tue.	4	7.20	5.30	4.45	5.35
Wed.	5	8.10	5.30	4.40	5.45
Thu.	6	9.00	5.30	4.40	5.45
Fri.	7	10.00	5.30	4.40	5.45
Sat.	8	11.00 FQ	5.30	4.40	5.45
Sun.	9	12.00	5.40	4.40	5.45
Mon.	10	1.00 AM	5.40	4.40	5.45
Tue.	11	2.00	5.40	4.40	5.45
Wed.	12	3.10	5.40	4.30	6.00
Thu.	13	4.20	5.40	4.30	6.00
Fri.	14	No L.	No L.	4.30	6.00
Sat.	15	No L. FM	No L.	4.30	6.00
Sun.	16	No L.	No L.	4.30	6.00
Mon.	17	5.10 PM	7.50 PM	4.30	6.00
Tue.	18	5.10	9.00	4.30	6.00
Wed.	19	5.10	10.10	4.25	6.00
Thu.	20	5.10	11.10	4.25	6.00
Fri.	21	5.10 LQ	12.20 AM	4.25	6.00
Sat.	22	5.10	1.30	4.25	6.00
Sun.	23	5.10	2.30	4.25	6.00
Mon.	24	5.10	3.30	4.25	6.00
Tue.	25	5.10	4.30	4.25	6.00
Wed.	26	5.10	6.00	4.20	6.10
Thu.	27	5.10	6.00	4.20	6.10
Fri.	28	5.10	6.00	4.20	6.10
Sat.	29	5.10 NM	6.00	4.20	6.10
Sun.	30	5.00	6.00	4.20	6.10

TOTAL HOURS LIGHTING DURING 1902.

By Table No. 1.	Hrs.Min.	By Table No. 2.	Hrs.Min.
January	238.30	January	423.20
February	196.20	February	355.25
March	196.20	March	355.35
April	166.40	April	298.50
May	151.40	May	264.50
June	131.10	June	234.25
July	142.40	July	243.45
August	162.00	August	280.25
September	179.00	September	321.15
October	216.30	October	374.30
November	224.10	November	401.40
December	250.00	December	433.45
Total, yr.	2255.00	Total, yr.	3987.45







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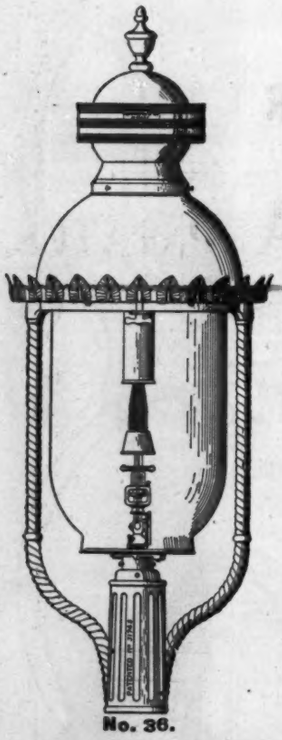

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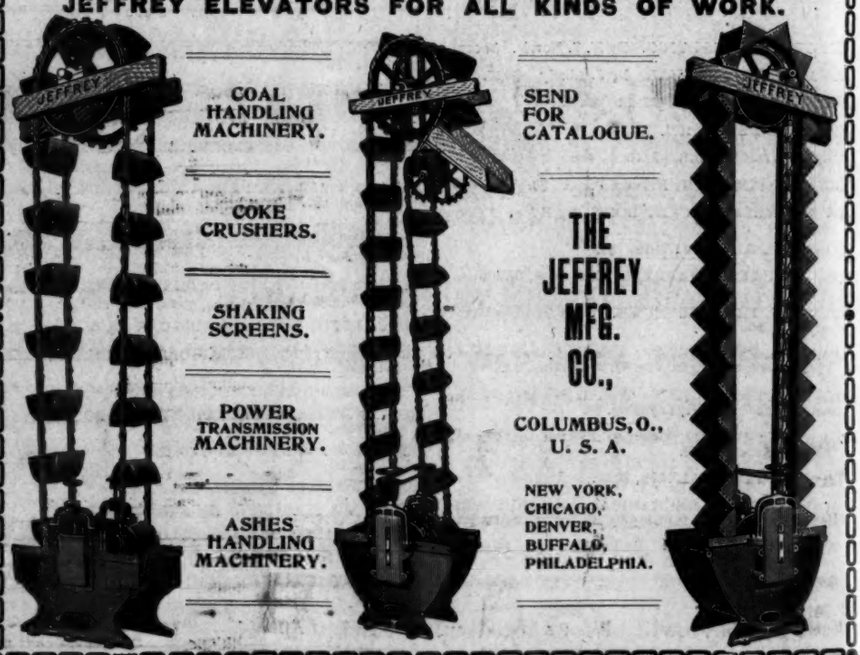

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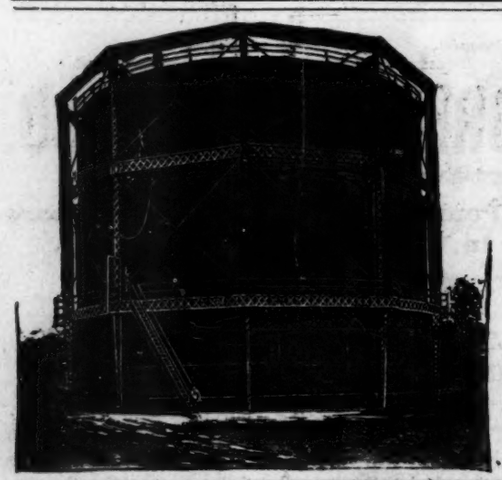

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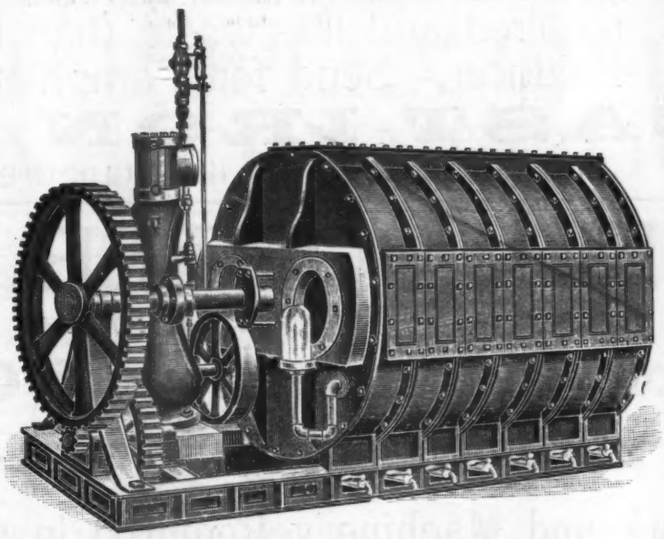

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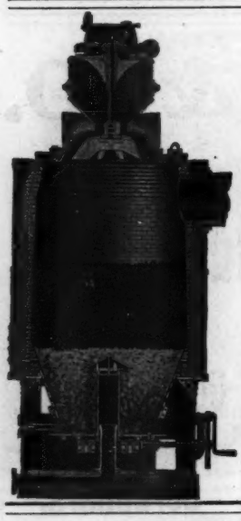

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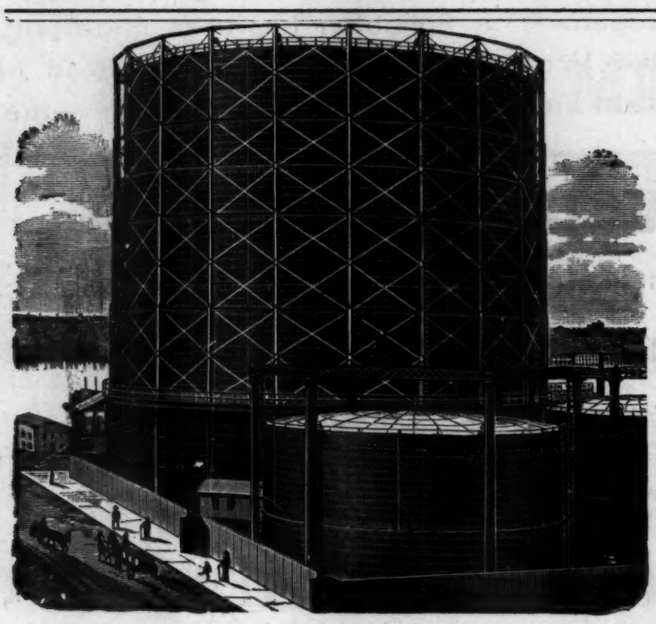

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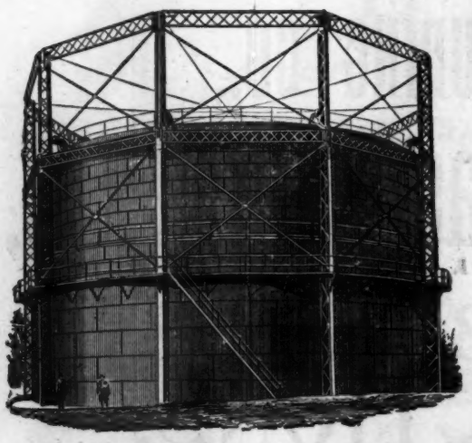

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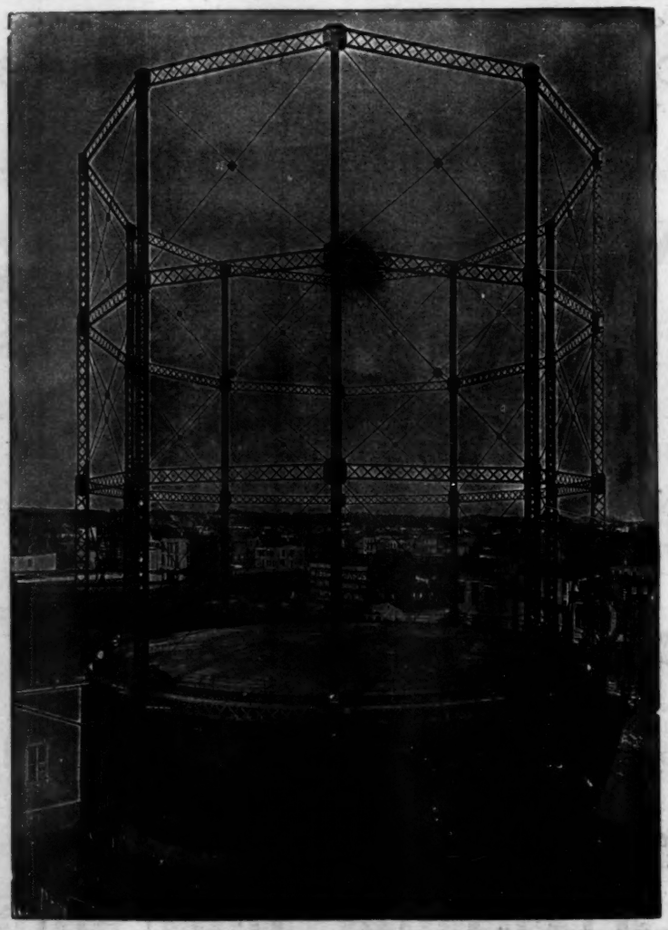

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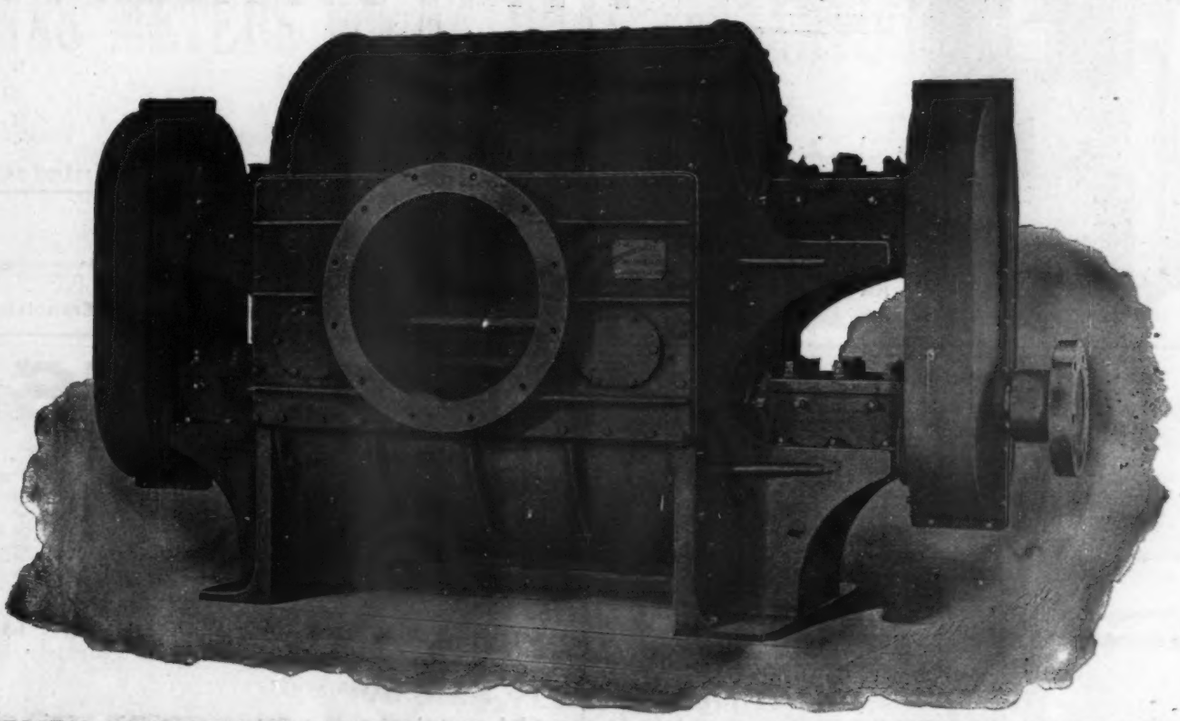

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